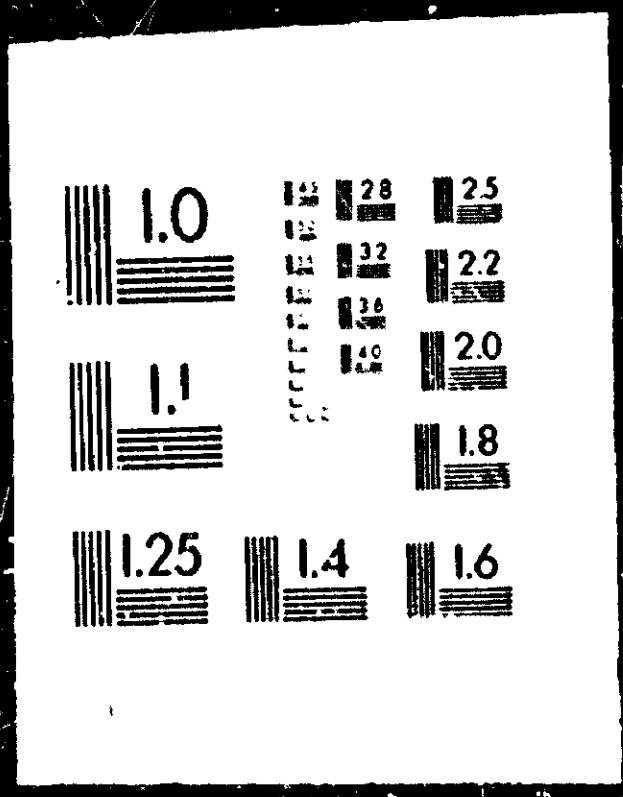
1 OF 1
PB88
917008



PB88-917008

Safety Study-Braking Deficiencies on Heavy Trucks in 32 Selected Accidents

(U.S.) National Transportation Safety Board
Washington, DC

30 Nov 88

U.S. Department of Commerce
National Technical Information Service
NTIS

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB/SS-88/06	2. Government Accession No. PB88-917008	3. Recipient's Catalog No.
4. Title and Subtitle Safety Study--Braking Deficiencies on Heavy Trucks in 32 Selected Accidents		5. Report Date November 30, 1988
7. Author(s)		6. Performing Organization Code
		8. Performing Organization Report No.
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Safety Programs Washington, D.C. 20594		10. Work Unit No. 4862E
		11. Contract or Grant No.
		13. Type of Report and Period Covered Safety Study Braking Deficiencies on Heavy Trucks in 32 Selected Accidents
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D.C. 20594		14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

Heavy truck braking performance is affected by the maintenance of the braking system. If parts of the system are inoperative or not functioning properly, system performance deteriorates. Of the 189 cases investigated by the Safety Board, this safety study focuses on 32 cases that involved heavy trucks with brake problems. Of these 32 accidents, one of the most prevalent vehicle-related safety issues that surfaced was out-of-adjustment brakes. The report concludes with recommendations to the National Highway Traffic Safety Administration, the American Trucking Associations, and the National Private Truck Council.

17. Key Words heavy trucks; braking performance; maintenance; human performance; automatic slack adjuster		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classification (of this report) UNCLASSIFIED	20. Security Classification (of this page) UNCLASSIFIED	21. No. of Pages 85	22. Price A05

NTSB Form 1765.2 (Rev. 5/88)

CONTENTS

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

SAFETY STUDY

BRAKING DEFICIENCIES ON HEAVY TRUCKS IN 32 SELECTED ACCIDENTS

INTRODUCTION

Truck safety on the nation's highways is a top priority at the National Transportation Safety Board. The Safety Board has had a longstanding commitment to reduce losses from all highway traffic accidents, and it is particularly concerned about accidents involving heavy trucks.[1]

Truck safety, however, is a complex subject, involving the search for safer drivers, safer vehicles, and safer highways. Recently, heavy truck safety has been the subject of numerous research studies and media reports. In part, this is due to the fact that although heavy combination-unit trucks[2] are involved in a relatively small proportion of motor vehicle accidents, the number of heavy combination-unit trucks involved in fatal accidents is disproportional. In 1987, combination-unit trucks were involved in 3.3 percent of all highway accidents, but 9.0 percent of the fatal accidents; their fatal accident rate per 100 million miles of travel was 4.3 compared to 2.1 for passenger cars. The consequences of all highway-related accidents in 1987 were 46,386 fatalities and 3.5 million nonfatal injuries. Accidents involving combination unit trucks accounted for 9.5 percent of these fatalities and 2.6 percent of the injuries.[3]

These statistics and media coverage of truck accidents have generated new initiatives on the part of government, safety advocacy groups, and the trucking industry directed at improving truck safety. The Safety Board's most recent contribution to improving truck safety, in addition to its regular ongoing highway accident investigation program, has been a series of heavy truck safety studies dating from 1985.

The first study, published in 1986, addressed three issues: state licensing procedures, the process by which people are prepared for employment as truckdrivers, and the Federal Motor Carrier Safety Regulations (FMCSR) regarding truckdriver qualification standards.[4] The Safety Board found that, although there are programs for training and licensing drivers, as well as government regulations and motor carrier screening procedures, unqualified and untrained drivers are able to obtain truck-

---

[1] In this study, the Safety Board defines a heavy truck as one with a gross vehicle weight rating of greater than 10,000 pounds.

[2] A combination unit is a truck or truck-tractor coupled to one or more trailers

[3] The 3.5 million nonfatal injuries is based on a 5-year (1982-87) average because the National Accident Sampling System did not collect this information for all of 1987.

[4] Safety Study--*Training, Licensing, and Qualification Standards for Drivers of Heavy Trucks*, April 1986 (NTSB/SS-86/02).

driving employment. Some of the recommendations made by the Safety Board in the 1986 report were incorporated into the Commercial Motor Vehicle Safety Act of 1986, which established a national driver license program for commercial drivers.[5] The next study focuses on operational issues. The first part of this study, Phase I, on which this braking report is based, was conducted from 1985 to 1987. A compilation of the accident case summaries has been published.[6] Phase II began October 1, 1987, and ended September 30, 1988; the results of that phase will be available in 1989.

---

[5] Title XII, Public Law 99-570

[6] Safety Study--*Case Summaries of 189 Heavy Truck Accident Investigations, October 12, 1988* (NTSB/SS-88/05).

BRAKE DEFICIENCIES

In late 1985, the Safety Board initiated a program of field investigations of heavy truck accidents.[7] From late 1985 through late 1987, the Safety Board investigated 189 accidents in 29 States. Investigators from eight of the Safety Board's regional offices participated in these investigations with assistance from the Washington, D.C. headquarters. The criteria covering the types of accidents investigated were quite broad--crashes involving trucks of 10,000 pounds gross vehicle weight rating or more with tow-away damage. The Safety Board's cases are a sample of convenience and are neither statistically significant nor representative of all truck accidents because Safety Board investigators were unable to respond to all (or a random sample of) notifications of accidents meeting the criteria, and because in one State, investigators focused (though not exclusively) on a specific type of accident--twin trailer combination accidents.

In determining the probable cause of each of these accidents, the Safety Board collected extensive documentation on the driver, the pre-accident condition of the vehicle, the highway, and the operating practices of the accident-involved motor carrier.

Results

Analysis of the accidents investigated during this period substantiated once again that accidents are rarely attributable to a single cause. The majority of the cases involved human performance errors on the part of the truckdriver, a passenger vehicle driver, or other motor carrier employees. (Problems associated with inadequate human performance are being explored in greater depth during Phase II of the study.) However, human performance errors were often compounded by the mechanical condition of the vehicle.

During its investigation, the Safety Board found that some drivers were operating poorly maintained vehicles that were not "forgiving" of even a minute human error. In fact, these accidents revealed that brake system deficiencies were the most frequently encountered vehicle-related problem. The Safety Board was unable to inspect every truck for mechanical problems because some trucks were destroyed and others were not available; however, the Safety Board determined that poorly maintained, malfunctioning, or inoperative brakes were a significant problem on 32 vehicles.[8] Among these accidents, the most prevalent problem was brakes out of adjustment (20 out of 32).[9] In the remaining 12 accidents, the brakes were within recommended adjustment limits, but other components of the system were in various stages of disrepair.[10]

The average age of these 32 tractors was 8.9 years, whereas the average age of the tractors in all the 189 cases was 6.1 years. Trailers followed the same pattern--the average age of the trailers being powered by the 32 tractors was 9.3 years, and the average age of trailers in all the 189 cases was 6.8 years. The larger motor carriers (101 tractors or more) involved in the 189 accidents were

---

[7]Because these accidents constitute a set of cases and not a random sample, all of the findings discussed in the following sections should be read in the light of this caveat

[8]See appendix A--cases 6, 8, 9, 11, 14, 17, 19, 20, 38, 39, 42, 51, 66, 78, 80, 83, 84, 93, 96, 115, 128, 132, 134, 140, 142, 146, 155, 156, 164, 168, and 178.

[9]See appendix A--cases 6, 8, 9, 14, 17, 19, 20, 42, 66, 78, 80, 83, 93, 121, 128, 140, 142, 146, 156, and 178.

[10]See appendix A--cases 11, 38, 39, 51, 84, 96, 115, 132, 134, 155, 164, and 168.

operating newer equipment than were medium (26 to 100 tractors) or small carriers (1 to 25 tractors); the average age of the tractors operated by large carriers was 4.0 years, by medium carriers was 5.5 years, and by small carriers was 7.5 years. Again, this pattern was true for trailers: the average age of trailers operated by large carriers was 5.2 years, by medium carriers was 6.8 years, and by small carriers was 8.4 years.[11]

Brake Adjustment

This report focuses on the 20 accidents in which the Safety Board found brakes out of adjustment on the accident-involved truck. Although the adjustment problem may not have caused the accident in some of these cases, the issue is important because any truck operating with out-of-adjustment brakes has a reduced margin of safety. Whenever the margin of safety is reduced, drivers' ability to recover from either their own error or that of another driver is impaired. Out-of-adjustment brakes can create a condition which is unforgiving of mishaps or human error.

In 7 of the 20 cases, adjustment was the only brake system problem.[12] In 13 other cases, the brake adjustment problem was compounded by other brake system problems, including defective, worn-out, or absent brake linings, liquid in the air tank, air line leaks, and inoperative brakes.[13]

The airbrake adjustment level is critical and must be maintained so that the air chamber pushrod stroke is minimized. Cam-type drum brakes are used on more than 95 percent of all air-braking vehicles manufactured today. When the brakes are applied in an airbrake system, air pressure forces the air chamber diaphragm and pushrod to move; the pushrod rotates the slack adjuster, which in turn rotates the cam shaft. The rotating cam shaft causes the S-cam to spread the brakeshoes which contact the brake drum. For the system to function at 100 percent effectiveness, the slack adjuster must be at a 90°-angle to the pushrod at full extension. When brakes are not at the manufacturer's recommended adjustment level (out of adjustment), the system loses some of its mechanical efficiency. In addition, airbrakes are actuated through a treadle valve that has a relatively short stroke and is unaffected by brake chamber displacement. It is, therefore, difficult for drivers to sense, via pedal "feel," that the brakes are out of adjustment and are incapable of full performance.

If the braking force at a given axle(s) is diminished because the brakes are out of adjustment, other properly adjusted brakes must take up the slack and do more than their share of the work; thus, the brakes may overheat. According to the National Highway Traffic Safety Administration (NHTSA), brake torque on relatively "cool" brakes (200° F) continually drops as the adjustment level degrades. At the manufacturer's recommended readjustment point, the torque has dropped to 85 percent of its fully adjusted level. When the brake is hot (600° F), the torque drops to 50 percent.[14]

Six of the vehicles with brake adjustment problems were involved in accidents while the truck was either descending a grade or at the bottom of a grade; it is reasonable to assume that in these accidents, the brakes were hot. For example, in case 19, a 1980 tractor pulling two van trailers

---

[11]According to a report published by the Office of Technology Assessment (*Gearing up for Safety: Motor Carrier Safety in a Competitive Environment, OTA-SET-382, September 1988*), in the overall U S fleet, "Some firms with good safety records keep their tractors for 7 or 8 years, undertaking major engine overhauls at 300,0000 miles Others choose to replace tractors at 4 years or 500,000 miles, finding maintenance too costly after that. Reflecting these varying decisions over the past 18 years, the median age of heavy trucks; in the commercial fleet rose from 6 years in 1978 to 7 1/2 years in 1985 and has settled at about 7 years after strong sales in 1987."

[12]See appendix A--cases 14, 78, 83, 121, 142, 156, and 178

[13]See appendix A--cases 6, 8, 9, 17, 19, 20, 42, 66, 80, 93, 128, 140 and 146.

[14]*Heavy Truck Study*, NHTSA, March 1987.

weighing approximately 80,000 pounds was traveling down a 3.2-mile grade. Approximately 1/2 mile before reaching the bottom of the grade, the driver lost his brakes. The truck continued downhill, out of control, at a witness-estimated speed of 40 to 50 mph. As the combination unit was crossing a curved bridge at the foot of the hill, all three units overturned. The truck driver received moderate injuries.

The Safety Board was unable to measure the pushrod stroke of the second trailer and the dolly because after the accident, the trailer brakes had been tightened against the drums, and the dolly had been repaired and put back into service.[15] However, all the brakes on the tractor, including those on the front axle, were out of adjustment by at least 3/8 inch. The driver did not know what gear he was in when he started his descent.

The motor carrier told the Safety Board that the drivers are responsible for on-the-road brake adjustment, and the accident-involved driver had been around trucks all his life and should have known how to adjust brakes. However, the driver said he knew nothing about brake adjustment.

In case 66, a 1981 tractor with a log trailer mounted directly on the rear of the tractor (the trailer could provide no braking) was traveling down a 7 to 12 percent grade when the driver applied his brakes with no effect. He pulled the parking brake valve, but he was still unable to reduce his speed. The driver did not know whether he was in fourth gear direct or indirect. At the bottom of the hill, the logging truck struck the rear of a towing truck, the last vehicle in a queue of four waiting at a red signal light. Eight people were injured.

The Safety Board calculated the available torque for each brake, assuming the air pressure, tire rolling radius, and brake lining friction coefficient were similar for each axle equipped with service airbrakes, and it concluded that braking was reduced to a range of 63 to 45 percent, depending on the temperature of the brake drums. The braking capability of this vehicle was probably closer to 45 percent because the driver said he applied the brakes all the way down the hill. In this case, it was even more imperative that all available brakes be in adjustment because the tractor had no front axle brakes.

The vehicles with brake adjustment problems had from 20 to 80 percent of their brakes out of adjustment. Data from a 1984 Office of Motor Carriers (OMC) report showed that after measuring brake adjustment on 400 air-braked vehicles, researchers found that the average truck had 30 percent of its brakes out of adjustment.[16] It seems reasonable to assume that the accident-involved vehicles in the Safety Board's cases would have more brake problems than the OMC sample, which included nonaccident-involved vehicles. Although the circumstances surrounding and the causes of these accidents varied, the Safety Board believes these vehicles with deficient brakes were accidents waiting to happen.

In 13 of the accidents, the problem of brake adjustment was compounded by other brake system problems. For example, a 1977 tractor towing a flatbed trailer was traveling on a straight section of roadway when a passenger car initiated a U-turn across the path of the truck. The truck driver braked, but the truck struck the passenger car on the left side (90 feet of the truck's precrash skidmarks were observed at the accident site). Four people were killed and two injured.

---

[15] A converter dolly is a coupling device composed of one or two axles and a "fifth wheel"; it is used to convert a semitrailer to a full trailer so it can be coupled to the rear of a tractor-semitrailer unit, making the combination into a twin trailer combination

[16] Hargadine, E. and Klein, T., *Braking Performance Level of Trucks 1983*, U.S. DOT/FHWA Contract No. DTFH61-83-C-00082, 1984.

The Safety Board investigation revealed that the factory-installed front axle brakes on the tractor had been disconnected, and three of the unit's remaining eight brakes were out of adjustment. Although the passenger car driver's actions caused this accident, a fully operational brake system on the truck would have decreased the impact speed, which could have lessened the severity of the injuries to the passenger car occupants (case 20).

Brake System Maintenance

Although the Safety Board cannot say with any degree of certainty why the brakes on those accident-involved trucks were out of adjustment, it did find that carrier maintenance practices varied substantially, and responsibility for maintaining brake adjustment was unclear. The FMCSR (Title 49 Code of Federal Regulations 396.3(a)) state:

> Every motor carrier shall systematically inspect, repair, and maintain, or cause to be systematically inspected, repaired, and maintained, all motor vehicles subject to its control.

The Safety Board found that some of the carriers involved in these accidents appear to have performed little if any maintenance, including brake adjustment; other carriers adjusted brakes on their owned vehicles only if the driver complained. The consequences of this maintenance policy could lead to loss of life because poor brake performance probably would not be detected until high-level braking was required to avoid an accident. Many of these carriers could not provide any maintenance records for the accident-involved vehicle. In contrast, other carriers performed regularly-scheduled maintenance and could provide maintenance records for the accident-involved vehicle.

The maintenance policy became less predictable if the vehicle was leased by the carrier from an owner/operator. Some carriers provided maintenance services, at cost, to owner/operators, while other carriers required owner/operators to submit repair receipts and maintenance records on their vehicles. In other instances, carriers did not fulfill any maintenance oversight responsibility for leased vehicles, as in case 134. While operating under a 30-day lease with one carrier, the owner/operator of the case vehicle was trip-leasing with two other carriers. At the time of the accident, the tractor had a bald tire on the steering axle, the air tank contained 1 gallon of water, the trailer's brakes on axle 4 were out of adjustment, and the brakes on axle 5 were inoperable. The trailer's tandem axle was secured by chains bolted from the carriage to the trailer frame as a repair for broken welds. The trailer frame around the king pin plate was rusted through in places, and the trailer frame metal was reduced from 1/4- to 1/16-inch thick in some areas by corrosion. At the time of the accident, this vehicle was 9,500 pounds overweight.

Among the accident-involved carriers, the responsibility for on-the-road brake adjustment varied and was often unclear. As in case 66, some carriers expected their drivers to perform on-the-road adjustment, while others had strict policies against drivers tampering with brakes. (These carriers usually provided the driver with an emergency number to call for on-the-road service.) In several cases, drivers who were responsible for brake adjustment did not know how to perform the brake adjustment properly.

Checking airbrake adjustment properly is a time-consuming task. Drivers, mechanics, and carriers would benefit from any device that made the process easier. As a result, some brake component manufacturers are equipping new brake chambers with a visual indicator that will alert the driver or mechanic that the brakes are out of adjustment.

Lack of Truck Accident Data

Determining the extent of the brake system-related safety problem nationwide is difficult because there is a general lack of basic truck safety data nationwide. The only available information on the mechanical condition of nonaccident-involved trucks on the road is derived from Federal and State roadside inspections. In the past, this information could not be used to estimate the nationwide scope of mechanical deficiencies because the proportion of trucks being inspected was small (and was limited primarily to interstate trucks only) and because the trucks chosen for inspection were usually selected by the inspector because the truck appeared to be in poor mechanical condition. Thus, the findings from these inspections could not be assumed to be representative of the heavy truck population as a whole.

Recently, States have become more active in roadside truck inspections through such programs as the Commercial Vehicle Safety Alliance and the Federally-aided Motor Carrier Safety Assistance Program. This increase in State inspection programs has had two major effects on overall knowledge of truck safety: it has increased the proportion of the truck population being inspected; and it has broadened the coverage to include more intrastate trucks. Nevertheless, the trucks being selected for inspection are still not randomly selected in all States; rather, the trucks tend to be those the inspectors suspect have mechanical deficiencies. Thus, even this expansion does not provide truck condition data that are representative of the overall population.

Even agreement on the number of accidents involving trucks is lacking. For example, in 1984, the National Safety Council reported 6.1 million accidents involving trucks, the NHTSA reported 364,000, and the Federal Highway Administration (FHWA) reported 37,000. The figures vary depending on the definition of a truck and the source of the accident information.

The Department of Transportation maintains three data bases that contain information on truck accidents. Two, the Fatal Accident Reporting System (FARS) and the National Accident Sampling System (NASS), are operated by the NHTSA. The third, the Accident Data File (50-T), is operated by the FHWA's OMC.

The FARS file is a national census of fatal accidents based on police accident reports. The data are limited in scope and accuracy and do not contain detailed information on the vehicle's mechanical condition.

NASS is a sample of all accidents (fatal and nonfatal). However, the sample size of heavy truck accidents in the NASS file is very small, and thus, its use for truck studies is limited. In addition, NASS does not collect in-depth information on the pre-accident condition of the vehicle.

Unlike FARS and NASS, the OMC data base includes more in-depth information on vehicle-related factors (trailer body style, weight, cargo). However, the data base contains information only on interstate carriers, subject to the FMCSR, not on intrastate carriers, and therefore, it not representative of the entire motor carrier industry. (For example, intrastate carriers operated 18 percent of the accident-involved vehicles investigated by the Safety Board. However, 34 percent of the vehicles with brake system deficiencies were operated by intrastate carriers.

Another weakness in the OMC data base is that it relies on self-reporting by the accident-involved motor carrier; self-reporting often results in underreporting. Motor carriers are required to report any accident that involves a fatality, an injury, or property damage exceeding $4,400. However, OMC has estimated that underreporting ranges from 20 to 40 percent. The Safety Board found that 40 percent of the interstate carrier accidents it investigated during its 1985-87 program had not been reported to OMC, even though they met the OMC reporting criteria.

Self-reporting creates one additional weakness in the OMC data base. One of the questions on the OMC accident report form is, "Were mechanical defects or failures apparent on your vehicle at the time of the accident?" Motor carriers may be reluctant to answer this question affirmatively. Although 11 of the 21 interstate carriers (52 percent) operating the accident-involved vehicles with brake deficiencies reported the accident to OMC, only 1 answered this question affirmatively.

The University of Michigan Transportation Research Institute (UMTRI) data base--Trucks Involved in Fatal Accidents--is a nationwide census of fatal truck accidents since 1980. It is created by matching individual accident cases in the FARS and in the OMC data base, and it supplements the FARS data on fatal truck accidents with the vehicle and driver detail from the OMC carrier-reported data and police accident reports obtained from the States. Although UMTRI seeks to reconcile discrepancies between these data sources via telephone interviews with the investigating police officer or the motor carrier, it does not obtain additional information on the mechanical condition of the vehicle. Thus, this data base is not a useful source of information on brake involvement in truck accidents.

State accident data bases are developed and maintained by the individual States and are based on police accident reports. Some State accident report forms do not ask for information on vehicle condition, while others require the information only if it was a contributing factor in the accident; when the vehicle information is included, it may not be wholly reliable. At an accident scene, the police officer has numerous responsibilities including obtaining medical attention for injured persons and minimizing traffic delays. Inspecting the truck for mechanical defects may not be high on a police officer's priority list. If a defect is not clearly visible, it may well go unreported. For these reasons, little or no reliable information on truck brake involvement in accidents can be gleaned from State data bases or studies based on them.

Because the information on the frequency of specific mechanical problems is not available, the collected data on truck accidents vary or are underreported, and the data reported by motor carriers are questionable, the Safety Board cannot with any certainty compare or contrast its heavy truck accident data.

The Safety Board is not the only group concerned about the lack of reliable truck safety and accident data. On the Federal level, the National Research Council initiated a study in June 1988 to assess the adequacy of truck safety data and make recommendations for improvements. On the State level, the National Governors' Association's Center for Policy Research began a project in early 1987 to review the current condition of State-collected truck and bus accident data elements and develop ways to obtain more uniform data collection among the States. Both of these efforts may improve both the quality and quantity of truck safety data.

Previous Safety Board Work

Although the Safety Board was unable to compare its findings to larger data bases for the reasons discussed in this report, its findings are consistent with previous Safety Board work and with data published by the NHTSA.

On June 23, 1978, the Safety Board issued a recommendation to the NHTSA:[17]

H-78-48

Develop a Federal Motor Vehicle Safety Standard stating a performance requirement for all newly manufactured commercial vehicles to have equipment that would insure brakes being in proper adjustment at all times.

In the letter transmitting this Safety Recommendation to the NHTSA, the Safety Board stated:

> Although the adjustment of airbrakes is a relatively simple mechanical task, it appears that industry cannot be relied upon to implement the periodic inspections and routine maintenance necessary to detect and correct maladjusted brakes. The Safety Board is reluctant to recommend mandatory new hardware for brakes. However, repeated failures to inspect and maintain brakes properly have compelled consideration of such a solution. Automatic brake adjustment capability has the potential of insuring maximum brake performance at all times, not just in downhill speed-control situations. Improved axle by axle, and laterally, wheel by wheel, brake balance and timing will be enhanced with assured brake adjustment.

The wording of the recommendation was purposefully left in general terms, and the term "slack adjuster"[18] was not used because the Safety Board knew that the technology for this device for highway vehicles was not yet developed to the point that they could be immediately required. The Safety Board was aware that a study of some length would have to be carried out before fulfilling the intent of Safety Recommendation H-78-48.

The most current NHTSA response to Safety Recommendation H-78-48 is a March 25, 1987 letter stating that a multi-year research program on self-adjusting brakes, begun in 1979, would be completed in 1987. The letter also said:

> Early results of the current research on in-use performance of large truck brake adjusters show that the state-of-the-art in design and performance is not as well advanced as those brake adjuster systems now in use on passenger cars and light trucks.

---

[17]Several of the Safety Board accident cases that led to Safety Recommendation H-78-48 were downhill runaways in which a "domino effect" occurred in the braking systems; with some brakes out of adjustment, those still in adjustment overheated and lost effectiveness. This is the same phenomenon observed in some of the accidents in the Safety Board's heavy truck study.

[18]An automatic slack adjuster is a device with a built-in adjustment feature that maintains the cold static pushrod stroke at the vehicle manufacturer's recommended minimum level. In the cam brake, the air chamber pushrod applies linear force to the slack adjuster which converts the force into a rotary torque. The slack adjuster is attached to a cam shaft that connects with a cam located between the brakeshoes. During brake application, the cam shaft rotates and turns the cam forcing the brakeshoes equally against the brake drum. The friction generated between the brakeshoe linings and the brake drum provides the retarding force necessary to slow or stop the vehicle. The slack adjuster is equipped with an adjustment device that allows it to be repositioned automatically in relation to the cam shaft so that pushrod travel can be altered to coincide with wear in the brakeshoe lining.

> The Commercial Vehicle Safety Alliance (CVSA), of which 41 states and 10 Canadian provinces are now members, has become a major force encouraging the increased use of automatic slack adjusters. As part of CVSA state inspections, specifications for air chamber brake rod stroke length have been developed and were recently adopted by the [OMC] Standards for incorporation into the [FMCSR].
>
> The [NHTSA] anticipates that two major truck manufacturers will make automatic brake adjusters standard as a result of their recent studies. Because of competitive pressure in the large truck market to increase safety and reliability, both vehicle manufacturers and fleet owners are expected to move toward making automatic adjusters standard equipment without Federal rulemaking.
>
> We are continuing to monitor the situation, and have shared the results of our research with manufacturers to aid them in improving the performance of their products. When the current research program is completed this year, we will be in a better position to determine the next course of action.

The Safety Board replied to the NHTSA on July 9, 1987:

> We appreciate the information concerning the development of automatic slack adjusters for heavy vehicles and NHTSA's action to monitor the research related to this recommendation. We also understand that, in lieu of Federal rulemaking, many vehicle manufacturers and fleet owners will take positive steps toward making automatic adjusters standard equipment. The Safety Board is currently engaged in collecting data for a safety study of heavy trucks. We, therefore, propose to classify Safety Recommendation H-78-48 as "Open--Acceptable Alternate Action" pending a determination as to whether use of automatic slack adjusters remains a safety problem which appears to continue to require regulatory action.

The NHTSA has been monitoring the use of automatic slack adjusters in nine fleets (179 vehicles) throughout the country. According to the NHTSA, performance among different brands varied, but overall, most automatic slack adjusters performed well. While the completed report has not yet been published, it is expected to strongly support the safety enhancement to be gained by using slack adjusters.

In fact, manufacturers have now developed various airbrake actuation devices with visual indicators. All the indicators give visual clues as to when the brakes need adjustment. For example, one company has an orange band located between the push rod disc and the diamond knurl on the service pushrod. The orange band (stroke indicator) will only start to protrude outside of the mounting face of the service housing when the spring brake or service chamber has only 1/2 inch of stroke remaining.

Based on the NHTSA effort, the Safety Board has classified Safety Recommendation H-78-48 "Closed--Superseded," and it will issue, with this report, a new recommendation that is more specific.

Safety Recommendation H-81-1 was issued to the NHTSA as a result of an investigation of a tractor-semitrailer accident in Pittsburgh, Pennsylvania, on April 28, 1980. Safety Recommendation H-81-1 asked the NHTSA to place a higher priority on Safety Recommendation H-78-48 and to "require manufacturers of airbrake actuation devices to incorporate indicators which will warn users when brakes must be adjusted." In its recommendation letter, the Safety Board also stated that it was concerned about the February 22, 1980 Advance Notice of Proposed Rulemaking regarding the long-range research objective on automatic brake adjustments. The NHTSA still has not published

the results of the long-term research program but expects to do so soon. In light of the recommendations being issued to the American Trucking Associations and the National Private Truck Council, Safety Recommendation H-81-1 has been reclassified "Closed--Superseded."

The NHTSA Study

In its 1987 report, the NHTSA discussed the causes of truck accidents in terms of driver behavior, vehicle-related factors, highway environment, and motor carrier operating practices.[19] However, the primary thrust of the report was to identify the key vehicle-related factors contributing to the cause of truck accidents and to suggest short- and long-term actions that could improve truck safety.

The NHTSA report says that although there is a lack of data on the number of accidents related to brake system performance, there are four types of accidents that could be influenced by improvements in brake system performance: accidents due to failed or inoperative brakes, run-aways on downgrades, skidding or loss-of-control accidents in which wheels locked during braking, and accidents in which brakes did not fail or were ineffective due to heat, but simply did not provide the stopping force necessary to avoid the accident.

The NHTSA report also discussed the effect of poor maintenance on brake system performance. It stressed that if parts of the system are inoperative or not functioning properly, overall system performance deteriorates rapidly. Brake adjustment was cited as one of the most frequent problems, one that could be reduced if more trucks were equipped with automatic slack adjusters. The NHTSA estimated that approximately 20 percent of the vehicles in use are equipped with automatic slack adjusters, but that use of automatic slack adjusters is increasing.

At present, all manufacturers offer automatic slack adjusters as optional equipment; some manufacturers offer the adjusters as standard equipment on specific models. (See figures 1 and 2.) In 1989, automatic slack adjusters will be standard on all Ford heavy truck tractors. In addition, some carriers are having automatic slack adjusters installed on all new equipment. For example, 60 percent of the tractors and 40 percent of the trailers in Yellow Freight's fleet are now equipped with automatic slack adjusters. By installing automatic slack adjusters on both tractors and trailers, motor carriers will avoid incompatibility problems between tractor and trailer brake systems. The supervisor of maintenance training for the company said the company is a "solid supporter" of automatic slack adjusters for a variety of reasons, including improved safety and lowered labor costs--the adjusters reduce the need for frequent brake adjustments and may result in more even brake wear, thus lowering brake replacement costs.

---

[19] *Heavy Truck Study*, NHTSA, March 1987.

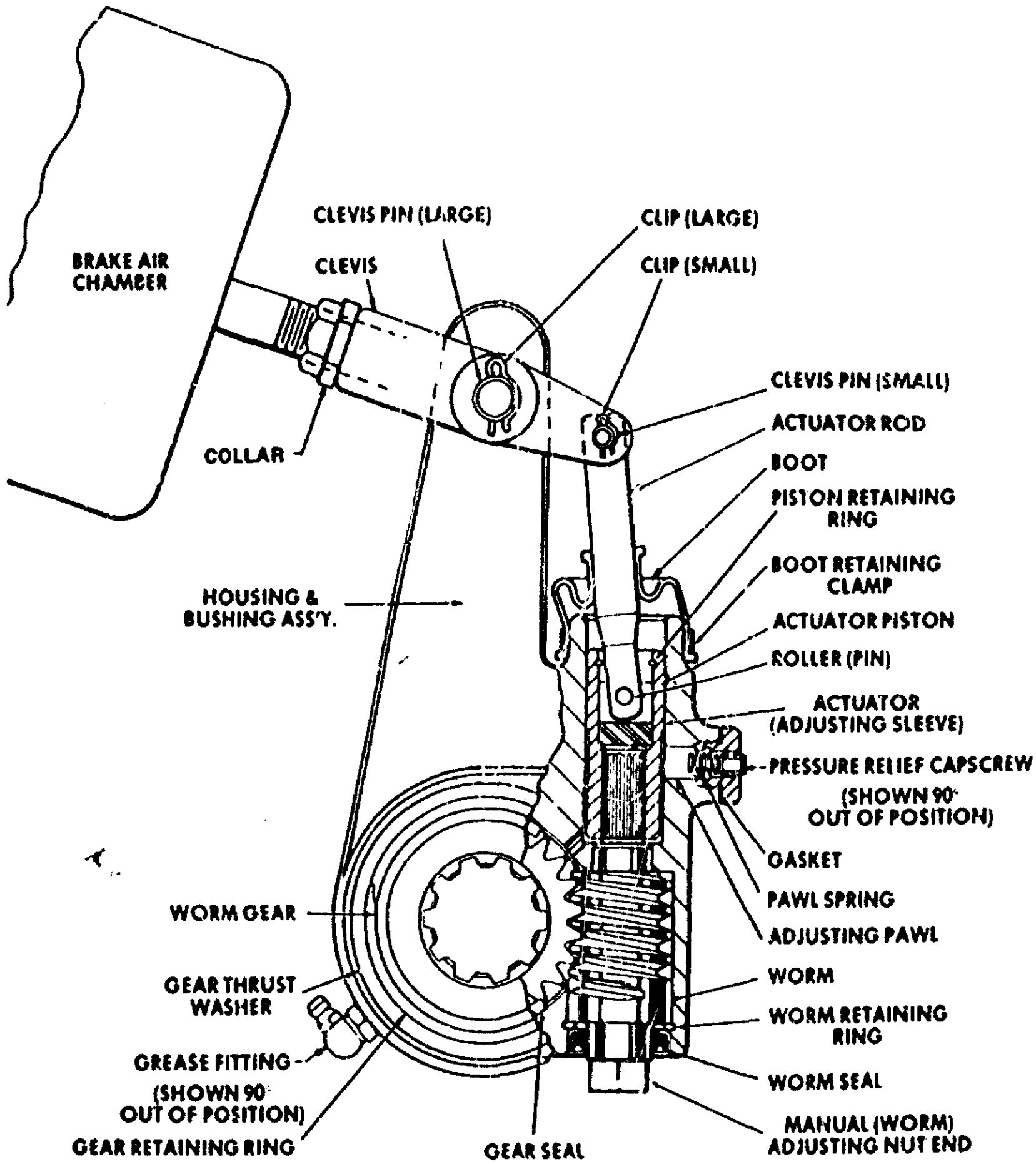


Figure 1.--Automatic slack adjuster.

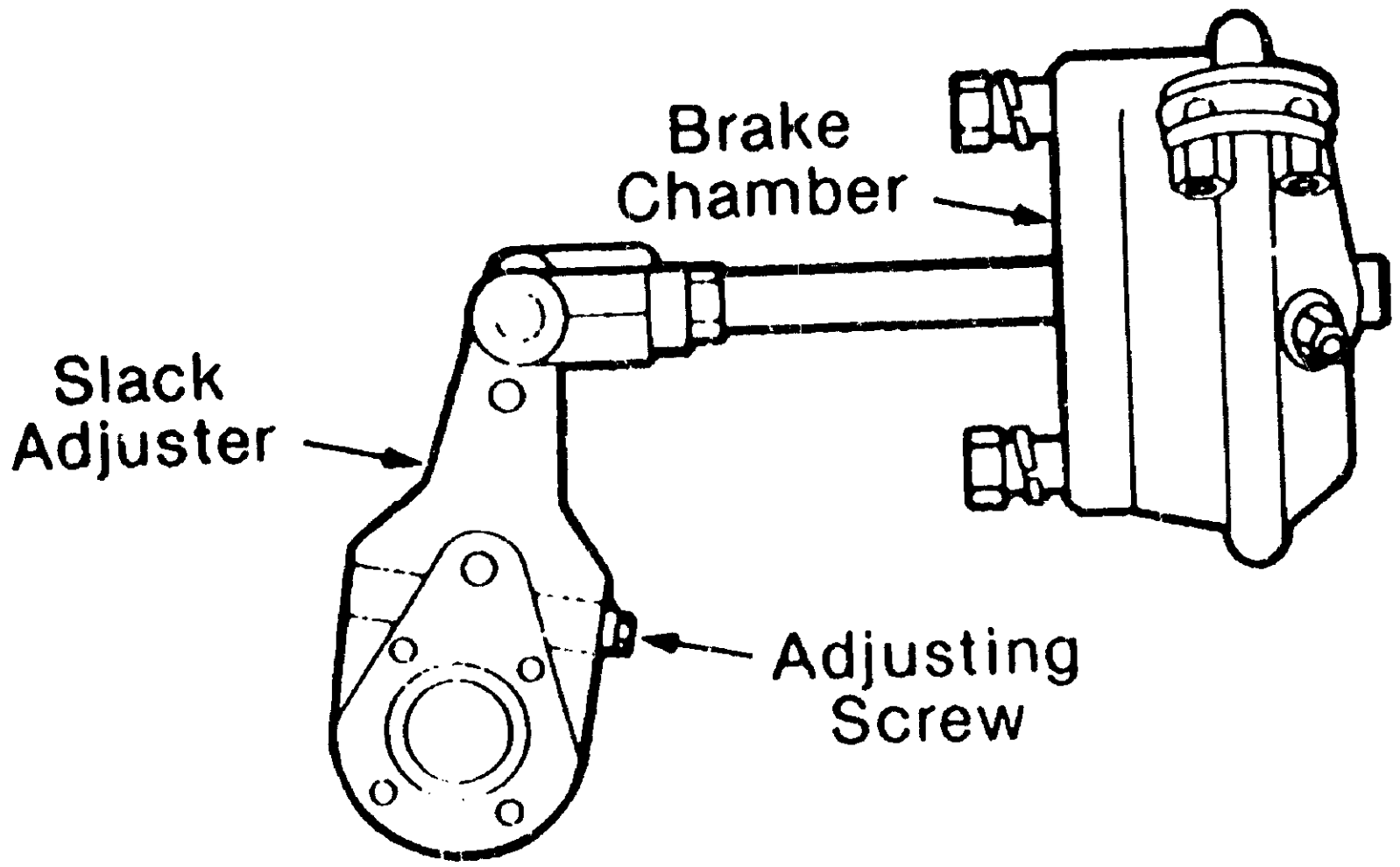


Figure 2.--Manual slack adjuster.

CONCLUSIONS

1. The majority of the 189 accidents investigated during Phase 1 of the Safety Board's heavy truck study involved human performance errors of a passenger vehicle driver, the truckdriver, or other motor carrier employees; these human performance errors were often compounded by deficiencies in the mechanical condition of the truck.

2. Poorly maintained, malfunctioning, or totally inoperative brakes were a significant problem on at least 32 of the trucks involved in these accidents. The most prevalent braking deficiency documented was brakes out of adjustment.

3. The average age of the tractors and trailers with brake system deficiencies was greater than the average age of those in the entire set of cases.

4. The average age of the equipment operated by large motor carriers was lower than that of equipment operated by medium or small carriers.

5. Among the accident-involved carriers, it was often unclear as to who was responsible for on-the-road brake adjustment.

6. Some drivers responsible for brake adjustment had not been trained to adjust truck brakes properly.

7. Determining the nationwide extent of the brake system-related safety problem is not possible because of the general lack of representative data on heavy truck mechanical condition and lack of adequate data on heavy truck accidents.

8. More widespread use of automatic slack adjusters would reduce the incidence of out-of-adjustment brakes on heavy trucks.

9. Automatic slack adjusters are practicable and are currently being installed on some newly-manufactured heavy trucks.

10. Airbrake actuation devices that incorporate indicators which will warn users when brakes need to be adjusted would make it easier to know when to adjust brakes without automatic slack adjusters, and might reduce the incidence of out-of-adjustment brakes.

11. Caution should be exercised when not all units of a combination unit truck are equipped with automatic slack adjusters to be certain all brakes are properly adjusted.

RECOMMENDATIONS

As a result of this study, the National Transportation Safety Board recommends:

--to the National Highway Traffic Safety Administration:

Publish a final rule by June 1990 that will require automatic slack adjusters on all new trucks equipped with air/mechanical brake systems. (Class II, Priority Action) (H-88-30)

--to the American Trucking Associations and the National Private Truck Council:

Recommend that your member carriers adopt written policies regarding on-the-road brake adjustment; if the drivers are responsible for performing such adjustments, provide them with the necessary training. (Class II, Priority Action) (H-88-31)

Recommend that your member carriers, as they replace worn brake chambers, install airbrake act[illegible]on devices that incorporate indicators to warn users when brakes must be adjusted. (Class II, Priority Action) (H-88-32)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES L. KOLSTAD
Acting Chairman

/s/ JIM BURNETT
Member

/s/ JOHN K. LAUBER
Member

/s/ JOSEPH T. NALL
Member

/s/ LEMOINE V. DICKINSON, JR.
Member

November 30, 1988

APPENDIX A

SUMMARIES OF SELECTED ACCIDENT CASES

The following accident summaries highlight the braking performance in 32 accidents investigated during Phase I of the Heavy Truck Study. These summaries are supported by full investigative dockets maintained at the National Transportation Safety Board's headquarters in Washington, D.C. A compilation of all 189 cases investigated during Phase I, *Case Summaries of 189 Heavy Truck Accident Investigation* (NTSB/SS-88/05), has been published.

CASE NO.: 6

Investigation No.: SEA-86-H-TR07
Accident Location: South Texas Road at intersection with Burlington Northern railroad tracks, Anacortes, Washington
Lanes: 2
Median: None
Features: Grade crossing protected by advance warning and crossbucks. 764-foot radius left curve.
Date and Time: March 4, 1986, 1:44 p.m.
Ambient Conditions: Overcast and dry
Heavy Truck Involved: 1968 Peterbilt COE tractor in combination with 2 loaded 20-foot bottom dump trailers
Motor Carrier: American Plant Services
Type of Operation: Common Carrier
Size of Operation: 8 power units
Total Weight of Truck(s): 79,800 pounds
Total Length of Truck(s): 60 feet estimated
Other Vehicle Involved: Burlington Northern freight train
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was traversing a -7 percent grade approaching a railroad grade crossing as a freight train was nearing the crossing at a recorded speed of 20 mph. As the train crossed the roadway, the front of the tractor struck the right side of the engine. The impact peeled open the front of the cab and rotated the tractor approximately 70^{0} clockwise.

This collision resulted in minor damage to the freight train's lead engine and no injuries to the train crew. The power unit of the doubles combination received major damage. The unrestrained driver was ejected and sustained serious injuries.

The investigation revealed that there was adequate sight distance for the truckdriver to see the train, perceive the problem, apply his brakes, and stop before reaching the track. An examination of the combination unit's braking system revealed that on the power unit, one brake was inoperative and one was out of recommended adjustment. Five of the six brakes installed on the converter dolly and trailers were out of adjustment. The remaining brake was at its maximum stroke allowable before adjustment is required. While the motor carrier related that each driver is responsible for the brake adjustments on both the tractor and trailers, no records of such adjustments were kept. Records supplied by the carrier revealed that the last preventative maintenance performed on the involved trailers was 9 months before the accident.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the inability of the truckdriver to stop the truck due to maladjustment of the brakes.

OF INTEREST IN THIS CASE:

1. Motor Carrier Oversight of Equipment
2. Grade Crossing
3. Double Trailers

CASE NO.: 8

Investigation No.: FTW-85-H-TR36
Accident Location: State Highway 114 at MacArthur Blvd., Irving, Texas
Lanes: 10-lanes, divided
Shoulders: Unknown
Median: 29 feet wide, grass
Features: Signal controlled intersection
Date and Time: June 5, 1985, 1:44 p.m.
Ambient Conditions: Daylight, clear, dry
Heavy Truck Involved: 1974 Kenworth COE tractor in combination with a loaded 1966 Fruehauf gravel trailer
Motor Carrier: J. D. Strickland
Type of Operation: Contract carrier
Size of Operation: Not determined
Total Weight of Truck(s): Approximately 71,000 pounds
Total Length of Truck(s): 55 feet
Other Vehicles Involved: 9 passenger vehicles
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 3 Other Injuries: 13

SUMMARY:

The combination unit was traveling east at a witness-reported speed of 60 to 75 mph in a 45 mph speed zone, when the truck failed to stop for traffic stopped at a signal controlled intersection. The truck struck the rear of a queue of three vehicles, deflecting them into four other vehicles. The truck then entered the intersection and struck additional vehicles. The truck veered to the right following the latter impacts and came to rest atop one vehicle and against another. Two of the involved passenger cars sustained ruptured fuel tanks and subsequently burned.

This accident resulted in the deaths of two persons due to thermal injuries, and the death of a third person due to blunt force trauma. At least 13 additional occupants of the passenger cars sustained some degree of injury. The truckdriver was not injured. The power unit of the combination unit sustained major damage while five of the passenger vehicles were destroyed by fires or impact damage. The remaining vehicles received minor to substantial damage.

The driver of the combination unit related that he thought he had fallen asleep, further stating that he commonly began work at around 2:30 a.m. and worked until late at night. Subsequent investigation revealed that the driver had been driving for 11 hours at the time of the accident. It was also noted that the braking system of the heavy truck was out of adjustment, the brake drums were badly grooved, and the air tank for the braking system had been contaminated with approximately 2 gallons of water.

This driver had been employed by the motor carrier for approximately 2 years. He was taught to drive the combination unit by its owner, then placed under the direction of an experienced driver for about 1 month. The owner of the combination unit performed all required maintenance.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the truckdriver's fatigued condition which affected his ability to perceive and react to the stopped traffic.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours

2. Motor Carrier Oversight of Equipment

CASE NO.: 9

Investigation No.: CHI-86-H-TR04
Accident Location: U.S. Highway 80, 1/4 mile east of Morrison, Illinois
Lanes: 2
Shoulders: 17-inch wide gutter
Median: None
Features: Straight, at-grade
Date and Time: January 24, 1986, 6:45 p.m.
Ambient Conditions: Snowing, approximately 1/2 inch of slush on roadway
Heavy Truck Involved: 1976 Freightliner COE in combination with a loaded 40-foot flatbed trailer.
Motor Carrier: Jones Motor Company, Inc.
Type of Operation: Common carrier
Size of Operation: 1296 power units
Total Weight of Truck(s): 68,800 pounds
Total Length of Truck(s): 52.5 feet
Other Vehicle Involved: 1979 GMC van
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 1 Other Injuries: 0

SUMMARY:

The combination unit was traversing a straight section of roadway, on an approximate 4 percent upgrade, when the tractor began to jackknife. As the power unit rotated clockwise, it left the roadway to the right and traveled several feet before the driver corrected the jackknife. The unit was redirected toward the travel lanes, however, before it re-entered the roadway, it rotated counterclockwise, and the driver lost control. The power unit crossed into the eastbound lane where it was struck in the right side by an eastbound van. Although a saddle tank on the power unit ruptured, there was no fire.

This accident resulted in substantial damage to the power unit of the combination unit and minor damage to the trailer. The left side fuel tank of the power unit was displaced and ruptured at some point during the jackknife dynamics, and the right side fuel tank ruptured as a result of the passenger vehicle impact. The passenger vehicle was destroyed by the impact. The unrestrained driver of the heavy truck sustained only minor injuries. The van driver, restrained by a lap/shoulder belt, was crushed within the collapsed front structure of his vehicle and later died.

The driver of the combination unit had 25 years experience operating heavy trucks. He had been employed by the motor carrier only 2 weeks at the time of the accident. Daily log records reflected that, up to the accident, the driver had been on duty for 11 1/2 hours. The investigation also revealed that the truck had averaged approximately 60 mph for the 75 miles immediately preceding the collision. This speed had been maintained despite the snow and slush upon the roadway surface.

The investigation revealed two of the power unit's four brakes to be out of adjustment, and two of the trailer's brakes were either inoperative or out of adjustment. In addition, suspension component defects were noted on both the right and left sides of the trailer. Records furnished by the carrier indicated that both the power unit and trailer had been fully inspected by the director of safety for the company who trip leased the vehicle. That inspection, conducted only 9 hours before the accident, certified that no deficiencies with either unit were found.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the truckdriver's failure to control his speed on surface conditions of snow and slush.

OF INTEREST IN THIS INVESTIGATION:

1. Motor Carrier Oversight of Equipment
2. Environment

CASE NO.: 11

Investigation No.: CHI-86-H-TR05
Accident Location: Interstate 70 in the Township of Mound, Illinois
Lanes: 4-lane divided
Median: Grass
Features: Straight and level
Date and Time: January 27, 1986, 6:00 a.m.
Ambient Conditions: Clear, dry, cold
Heavy Truck Involved: 1975 Freightliner COE 3-axle tractor in combination with an empty 43-foot livestock trailer
Motor Carrier: Delbert G. Neidigh
Type of Operation: Independent Owner/Operator
Size of Operation: 1 power unit
Total Weight of Truck(s): 26,400 pounds
Total Length of Truck(s): Not determined
Other Vehicle Involved: 1968 Volkswagen van
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 2 Other Injuries: 5

SUMMARY:

The tractor trailer unit was proceeding eastbound on Interstate 70 at a driver-estimated speed of 60 to 65 mph. The truck approached a slow moving van which was reported to be traveling 30 to 35 mph without rear lights. The truckdriver stated he "dozed off" and impacted the rear of the van. The passenger van began to burn immediately after the initial impact, as it traveled 541 feet to a resting position in the south road ditch. Following the impact, the truck went off the right road edge across the south roadside ditch, climbed the embankment, and struck and overrode two fences and a tree. The truck came to rest approximately 252 feet south of the roadway. The tractor trailer traveled a total of approximately 528 feet from the initial impact area.

Neither the unrestrained driver of the combination unit nor the codriver resting in the sleeper berth were injured. Two of the rear seat passengers of the Volkswagen van were killed. The five remaining passengers in the van escaped with minor injuries.

The driver stated he had 30 years of experience in medium to heavy truck operations, and often makes 2 to 3 delivery trips per week. It was found that the truckdriver routinely works full time on his farm driving the combination unit in addition to his farming. The investigation revealed that the truckdriver had been awake and active since 8 a.m. on the day preceding this collision, a period of 22 hours. This driver stated that he must have dozed off, as he remembered passing mile post 82 but nothing else up to the collision area at mile post 83. There were no log books being maintained in the truck. On the date of this accident, log books were not required for an intrastate trip within Illinois.

A search of driving history files showed this driver had accumulated two traffic violation in the past 5 years. The records also revealed this driver had been involved in three accidents in the past 2 years.

An inspection of this tractor trailer revealed several deficiencies with the braking system, principally air leaks. A wornout right front tractor tire and several worn tires on the trailer were also found, however, the trailer brakes were within recommended adjustments.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was a lack of vigilance on the part of the truckdriver due to working excessive hours. Contributing to the cause was the absence of rear lights on the slow-moving van.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Driving History
3. Motor Carrier Oversight of Equipment

CASE NO.: 14

Investigation No.: LAX-86-H-TR05
Accident Location: Interstate 5, 3.5 miles north of Fort Tejon, California
Lanes: 8 lanes, divided
Shoulders: Median shoulder undetermined width of asphalt, outside shoulder undetermined width of dirt
Median: New Jersey concrete barrier and varying earthen divider
Features: 6 percent downgrade, curves, and mountainous
Date and Time: February 7, 1986, 3:20 a.m.
Ambient Conditions: Dark, 40°F, clear, and dry
Heavy Truck Involved: 1975 Mack COE tractor in combination with a loaded 42-foot flatbed trailer
Motor Carrier: Albina Transfer Company, Inc.
Type of Operation: Common Carrier
Size of Operation: Not determined
Total Weight of Truck(s): 79,000 pounds
Total Length of Truck(s): 56 feet 4 inches
Other Vehicle Involved: None
Truck Fatalities: 2 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was traversing a 5-mile, 6-percent downgrade when the driver noticed a loss of brakes. Approximately 3 miles from the crest of the downgrade, the vehicle entered a 765-foot truck escape ramp which had a maximum grade of a +5 percent. The combination unit then traversed the entire length of the arrester bed, vaulted approximately 60 feet from the elevated end of the ramp, and fell about 30 feet onto some boulders. The load on the flatbed trailer came forward and crushed the cab. A fire ensued which destroyed the passenger compartment of the power unit.

The tractor was destroyed from the collision with the ground and the fire, and the trailer received substantial damage. The unrestrained driver and the right front passenger were fatally injured, while the passenger in the sleeper survived with serious injuries. Both passengers were unauthorized and were carried in violation of both carrier policy and federal regulations.

The investigation revealed that six of the combination unit's eight brakes were out of adjustment, the push-rod travel of each backed up to its maximum travel. The remaining two brakes could not be inspected due to damage. The surviving passenger stated that the truckdriver had checked his brake adjustments less than 1 1/2 hours before the accident. While the carrier related that brake adjustment was indeed the driver's responsibility, his employer neither furnished nor required training relating to this requirement. Also noted was inadequate tread depths for the majority of tires on the combination unit.

The driver of the combination unit had been employed by the motor carrier for approximately 6 weeks. While no record of previous heavy truck operating experience was documented, he had maintained a commercial operator's license for about 4 years. The carrier had furnished no in-house training.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the driver's failure to maintain his vehicle's speed on the mountain downgrade either due to improperly adjusted brakes. Contributing to the cause was the failure of the motor carrier to train the driver in proper brake system adjustment.

OF INTEREST IN THIS INVESTIGATION:

1. Driver Training/Experience
2. Motor Carrier Oversight of Equipment
3. Environment

CASE NO.: 17

Investigation No.: LAX 86-H-TR03
Accident Location: Transition from southbound I-15 to eastbound I-10 in Ontario, California
Lanes: 2
Shoulders: None-elevated road
Median: None
Features: Elevated transition road with left turn
Date and Time: January 1, 1986, 4:05 a.m.
Ambient Conditions: Dry, dark, extremely high crosswinds
Heavy Truck Involved: 1979 Ford COE tractor in combination with two loaded 27-foot trailers
Motor Carrier: PBI Freight Service
Type of Operation: Common Carrier
Size of Operation: Not determined
Total Weight of Truck(s): Not determined
Total Length of Truck(s): Not determined
Other Vehicle Involved: None
Truck Fatalities: 1 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was transitioning from the base of a 10-mile downgrade to an elevated interchange when the truck flipped onto the right bridge rail, overrode the rail, and fell to the ground 60 feet below. At the time of this occurrence, 40- to 100-mph winds were gusting in the area. These winds reportedly transitioned from a tailwind for the truck to a direct crosswind immediately before the accident.

The ground impact completely destroyed the power unit of the truck. The unrestrained truckdriver was ejected and sustained fatal injuries.

The investigation revealed that the braking system of the combination unit was seriously out of adjustment. The three brakes which could be checked on the power unit were well past adjustment limits, neither brake on the converter dolly was operational, and most of the remaining brakes were badly worn. In all, it was found that seven of the unit's ten brakes were improperly adjusted, two additional brakes were inoperative, and the remaining brake was not of the proper size.

Further investigation revealed that the truckdriver was apparently in violation of Hours-of-Service regulations, in that he could not have taken a required 8-hour rest period and still reached the accident location from his departure point. Log book entries from records furnished by the motor carrier indicated that the driver had probably not met the minimum for off-duty hours during the 48 hours preceding the accident.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the wind conditions existing as the truck transitioned from a 40- to 100-mph tailwind to a crosswind of the same velocity. Contributing to the accident was the lack of effective warnings pertaining to the venturi winds.

OF INTEREST IN THIS CASE:

1. Fatigue/Duty Hours
2. Motor Carrier Oversight of Equipment
3. Environment
4. Double Trailers

CASE NO.: 19

Investigation No.: SEA-86-H-TR06
Accident Location: State Route 35, Hood River,Oregon
Lanes: 2
Median: None
Features: 3.2-mile downgrade with a maximum slope of -5.2.percent and a curved bridge (240 ft. radius) at the bottom of the hill
Date and Time: February 24, 1986, 8:50 a.m.
Ambient Conditions: Clear and dry
Heavy Truck Involved: 1980 COE Ford tractor in combination with a 35-foot van trailer and a 28-foot van trailer, both loaded
Motor Carrier: Leonardo Truck Lines, Inc.
Type of Operation: Common Carrier
Size of Operation: 60 power units
Total Weight of Truck(s): Approximately 80,000 pounds
Total Length of Truck(s): 77 feet
Other Vehicle Involved: None
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was traversing a 3.2-mile winding downgrade. The driver reported that he lost his brakes at a point approximately 1/2 mile from the bottom of the hill. The unit continued down hill, out of control, at a witness-estimated speed of 40 to 50 mph. As the combination unit began crossing the curved bridge, all three units overturned. The tractor and semitrailer came to rest on their left side facing northeast, in the southbound lane. The full trailer separated from the semitrailer, went over a 32-inch high concrete barrier, fell approximately 35 feet, and landed on top of three 20,000-gallon fuel storage tanks. The metal structure of the first fuel storage tank was ruptured and the structures of the other two tanks were dented. There was no leakage from the damaged fuel storage tanks.

This accident resulted in extensive damage to the combination unit. The unrestrained driver received moderate injuries.

The vehicle examination disclosed that all of the brakes on the truck tractor and semitrailer were improperly adjusted, and that the brake drums were grooved from excessive wear. The motor carrier stated that brake adjustment was the driver's responsibility, but the driver related that he was unfamiliar with brake adjustment procedures. The motor carrier neither furnished nor required pre-employment training in the proper methods of brake adjustment.

The investigation found that no warning signs regarding the long downgrade were posted on the roadway, nor were there any speed restrictions for the grade. Just before a vehicle's entry onto the bridge, a 25 mph curve advisory speed sign was in place.

The driver reported that he was unsure of what gear the truck was in when traversing the downgrade. The investigation disclosed that the accident driver had been employed by this motor carrier for 1 month. Although the driver related 6 years of experience in the operation of heavy trucks, he had no experience in twin trailer operation before his current employment.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the improper adjustment and maintenance of the combination unit's brakes. Contributing to the cause was the motor carrier's failure to train the driver in proper brake adjustment procedures and the lack of adequate warning signs preceding the downgrade and curve.

OF INTEREST IN THIS CASE:

1. Motor Carrier Oversight of Equipment
2. Environment
3. Double Trailers
4. Driver Training/Experience

CASE NO.: 20

Investigation No.: FTW-86-H-TR04
Accident Location: Texas State Highway 21 at Farm Road 2818, Bryan, Texas
Lanes: 4 lanes
Shoulders: 10 feet wide, asphalt
Median: Solid yellow centerline
Features: At grade, straight, level
Date and Time: March 9, 1986, 4:25 p.m.
Ambient Conditions: Clear, daylight, dry
Heavy Truck Involved: 1977 Mack conventional 3-axle tractor in combination with a loaded 42-foot flatbed trailer
Motor Carrier: Pool Petroleum Services Company
Type of Operation: Private Carrier
Size of Operation: 200 power units
Total Weight of Truck: 43,500 pounds
Total Length of Truck: 65 feet
Other Vehicle Involved: Oldsmobile 4-door sedan
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 4 Other Injuries: 2

SUMMARY:

The combination unit was eastbound at a driver-estimated speed of 45 to 50 mph, when a 4-door sedan carrying six people initiated a U-turn across the path of the truck. The truck left 90 feet of skidmarks before striking the Oldsmobile in the left side. From the impact area, the passenger car rotated approximately 180° and skidded 140 feet before coming to rest. The combination veered across the travel lanes, skidding over 140 feet before coming to rest in the north road ditch. Witnesses' statements in combination with computer analysis of the sun's position, indicated that the passenger car driver's vision might have been affected by the glare.

This accident resulted in only moderate damage to the combination unit and the truckdriver was not injured. The passenger car was destroyed, and four of its six occupants were fatally injured.

The investigation revealed that the truckdriver had been on duty for 8 1/2 hours before the accident. He had driven about 250 miles during that period and was only 5 miles from his destination when the collision occurred. A search of this driver's license history found eight traffic violations committed in the 5-year period preceding the accident. Also noted were multiple violations of promises to appear in court, a prior criminal driving under the influence conviction, and a possession of dangerous drugs conviction. The motor carrier denied knowledge of their driver's history. The motor carrier refused to furnish employment records of the driver, and other information was not available for determination of the driver's accumulated experience in heavy truck operations.

An examination of the combination unit revealed that the factory installed front axle brakes for the power unit had been disconnected. In addition, it was found that three of the unit's remaining brakes were outside of proper adjustment. Officials of the motor carrier refused to discuss maintenance policies with Safety Board investigators, therefore, it was not determined who was responsible for brake adjustments.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was passenger car driver's failure to yield to conflicting traffic before initiating a U-turn. Contributing to the cause was the car driver's visibility limitation due to the angle of the sun. Contributing to the severity of the collision was the reduced braking efficiency of the truck.

OF INTEREST IN THIS INVESTIGATION:

1. Driving History
2. Motor Carrier Oversight of Driver
3. Motor Carrier Oversight of Equipment

CASE NO.: 38

Investigation No.: DEN-86-H-TR10
Accident Location: Interstate 25, 1 mile north of Denver, Colorado
Lanes: 10-lanes, divided
Shoulders: Median shoulder 3 feet asphalt, outside shoulder 12 feet asphalt
Median: New Jersey type concrete barrier
Features: Straight, level
Date and Time: April 21, 1986, 12:15 p.m.
Ambient Conditions: Clear, dry, 68°F, and sunny
Heavy Truck Involved: 1980 Mack conventional tractor in combination with with a loaded 40-foot flatbed trailer
Motor Carrier: Leavitt Lumber Company
Type of Operation: Private carrier
Size of Operation: 2 power units
Total Weight of Truck(s): 67,760 pounds
Total Length of Truck(s): Unknown
Other Vehicle Involved: Four passenger vehicles, 1 straight truck, and 1 other tractor-trailer
Truck Fatalities: 0 **Truck Injuries:** 0
Other Fatalities: 0 **Other Injuries:** 2

SUMMARY:

The driver of the combination unit arrived in Denver at 5 a.m. after a 10-hour trip. He then slept in the cab of the tractor for about 2 hours before having his truck unloaded. Next, he proceeded to pick up his new load of ten flattened automobiles and began his return trip to Utah. Just outside Denver, the driver crested a small hill and noted that traffic was stopped due to a minor accident. The tractor-trailer driver claimed that he was unable to stop by applying his brakes, so he swerved to his left to avoid other vehicles. His evasive attempts were not successful, however, and several vehicles were hit which started a chain reaction collision that involved four passenger vehicles, a straight truck, and another tractor-trailer.

This accident resulted in substantial damage to the Mack power unit but no injuries were reported by the unrestrained driver. Only one of the passenger vehicles received greater than moderate damage. Two of the passenger vehicle occupants sustained minor injuries.

An inspection of the combination unit revealed that the airbrake supply lines between the power unit and the trailer were taped with electrical tape at frayed areas. In addition, one air line was spliced with heater-hose and the rear service air valve on the trailer leaked air. On the power unit, it was found that the internal braking components for each side of the steering axle brakes had been removed. The oil seals on two of the power unit's rear brakes were leaking, and the brake shoes were oil soaked. The motor carrier related that service had been performed on the combination vehicle just 5 days before the accident. The driver reported that he had performed a pretrip inspection of the vehicle, but made no record of his inspection.

The truckdriver reported that he had approximately 5 years of experience in the operation of heavy trucks. Only three to four long-haul trips had been made each year, and the rest of his time was spent driving log trucks and in local delivery operations. No formal training was claimed.

From statements made by the driver, it was determined that he had slept approximately 3 hours in the 26 hours preceding the accident. The driver also revealed that he was not properly maintaining his driver log books and had no current medical certificate. Also, at the accident scene the driver acknowledged that he brought his log book up-to-date, showing him to be in compliance with hours-of-service rules, while the police officers were busy with the other accident victims. Copies of the driver's log books furnished later by the motor carrier conflicted with the logs taken from the truckdriver at the accident scene. Additionally, the motor carrier did not maintain driver qualification files as required by Federal regulations.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the drivers fatigued condition which affected his ability to perceive and react to the existing hazard. Contributing to the accident was the poor mechanical condition of the combination unit.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Driver Training/Experience
3. Motor Carrier Oversight of Driver
4. Motor Carrier Oversight of Equipment

CASE NO.: 39

Investigation No.: LAX-86-H-TR07
Accident Location: Interstate 5, 2 miles north of Tejon, California
Lanes: 8 lanes, divided
Shoulders: 8-foot asphalt
Median: Varying width dirt with -5 percent grade bound by a 24-inch high W-beam guardrail
Features: -6 percent grade, curving roadway
Date and Time: April 23, 1986, 5:37 p.m.
Ambient Conditions: Clear, daylight, and dry
Heavy Truck Involved: 1967 Freightliner COE in combination with 2 loaded flatbed trailers
Motor Carrier: Bettencourt and Sons
Type of Operation: Common carrier
Size of Operation: 4 power units
Total Weight of Truck(s): Approximately 80,000 pounds
Total Length of Truck(s): Not determined
Other Vehicle Involved: Not documented
Truck Fatalities: 2 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was proceeding northbound on the highway as it entered a 5-mile long, -6 percent grade, serpentine highway. Witnesses reported that the truck was moving slower than the other truck traffic and that his brakes were smoking. The truck was reported to have attempted to move to the shoulder but quickly returned to the traffic lane and started accelerating. Approximately 2 miles below the crest of the grade, another truckdriver saw the accelerating truck approaching in his rearview mirror. As the second truckdriver attempted to move to the shoulder to let the speeding truck pass by, he observed a California Highway Patrol traffic-stop ahead. The other truck then attempted to move to the left to give the truck lane over to the accelerating truck. As he did so, the case vehicle also moved to the left to go around. The combination unit struck the right rear of the preceding trailer with the left front of the tractor and severed the steering axle. The unit then veered across three lanes and impacted a median barrier. During the accident sequence, the rear trailer separated from the unit and overturned in the roadway. The first trailer and tractor partially surmounted and partially penetrated a median barrier, rotated 360° while traveling 55 feet down the median, and came to rest upright facing southwest.

As a result of the collision sequences, the power unit of the doubles combination was destroyed. Both unrestrained occupants, the driver and an unauthorized passenger, were ejected from the cab and fatally injured. The vehicle examination revealed that, during the collisions, the load of flat steel on the front trailer shifted forward and deformed the cab structure. There was no barrier present between the load on the trailer and the rear of the power unit.

Postcrash examination of the truck revealed that the service and emergency air lines had been crossed and there was no braking air supplied to either trailer. The company declared that the brakes were properly hooked up when the trailer left the yard but had apperently been rehooked by the driver. In addition to the crossed air lines, it was noted that the brake linings or both sides of the drive axle were oil soaked, there were excessive contaminants in the wet tank, and the spring brake on the right side of the drive axle was broken.

The investigation revealed that the driver had very limited experience in the operation of heavy trucks. A coworker reported that the job with his current employer was his first truck-driving experience. He had been employed by this carrier a month earlier, but was fired 6 days before the accident because of driving on two flats for several miles, thus destroying the wheels and hubs. The carrier had recalled the driver on the day before the subject accident because they were short one driver. In the 3 weeks of actual driving experience, the driver had been responsible for local delivery only and had not driven over the mountainous highway known as "the Grapevine."

The investigation also found that this driver had been on duty for 17 hours at the time of the accident--12 1/2 of which were spent driving. This on-duty activity was not in accordance with pretrip instructions given him by the carrier.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this collision was the lack of braking ability due to improperly connected air lines and inadequate brake system maintenance. Contributing to the accident was the driver's inexperience in heavy truck operations. Contributing to the severity of the collision was the poor crashworthiness of the power unit and the absence of a suitable barrier between the trailer and the power unit.

OF INTEREST IN THIS INVESTIGATION:

1. Driver Training/Experience
2. Fatigue/Duty Hours
3. Motor Carrier Oversight of Driver
4. Motor Carrier Oversight of Equipment
5. Double Trailers
6. Crashworthiness

CASE NO.: 42

Investigation No.: LAX-86-F-H009
Accident Location: State Route 71 in Chino, California
Lanes: 3 lanes, undivided
Shoulders: Outside shoulder 8-foot asphalt surface
Left shoulder 10-foot asphalt surface
Median: None
Features: Intersection, left turn lane, straight, level
Date and Time: April 28, 1986, 6:45 p.m.
Ambient Conditions: Clear, 75°F, dry, and daylight
Heavy Truck Involved: 1985 Freightliner COE tractor in combination with a loaded 48-foot van trailer
Motor Carrier: Jay Lines, Inc.
Type of Operation: Common carrier
Size of Operation: Not determined
Total Weight of Truck(s): Estimated at 73,000 pounds
Total Length of Truck(s): Unknown
Other Vehicle Involved: Two passenger vehicles
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 1 Other Injuries: 0

SUMMARY:

The combination unit was approaching a signal controlled intersection when the light turned red. According to witnesses, a motorcyle had already passed through the intersection before a passenger car entered the intersection from the truck's left. The truckdriver related tnat he attempted to brake. However, the unauthorized passenger in the truck stated that he told the driver to hit his brakes, but the driver said, "I'm not going to brake for anybody"--there were no preimpact skidmarks from the combination unit. The passenger further related that the driver did not try to avoid hitting the passenger car, however, another witness stated that he had heard the truckdriver activate the truck's horn. The tractor-trailer struck the right side of the passenger vehicle, and also caught the left front corner of another passenger vehicle which was in the intersection.

The collisions resulted in moderate damage to the power unit of the combination vehicle, but no injuries to the unrestrained truckdriver. Police reported an undefined injury to the passenger of the truck. The first passenger vehicle struck by the combination vehicle was destroyed, and its driver fatally injured. The second passenger vehicle struck received only minor damage and no occupant injuries resulted.

A strong odor of alcohol was noted by the investigating police officer, and the driver of the combination unit later submitted to a blood analysis which revealed a 0.21 BAC. A water pipe, commonly used for smoking drugs, was also found in the tractor cab. This driver later related to investigators that he had been consuming alcoholic beverages along with some type of cough medicine. A statement given later by the passenger indicated that the driver had consumed a 12 pint of vodka earlier in the day.

Employment records furnished by the motor carrier indicated that this driver had been employed by them for less than 2 weeks. Although the driver indicated on the application that he had accumulated approximately 27 years experience in the operation of medium and heavy trucks, only 4 years of this time was verified. A search of prior driving history revealed one violation, for improperly adjusted brakes, which occurred during the month before this accident.

An examination of the braking system on the tractor and trailer revealed that six out of ten brakes were out of adjustment. The four trailer brakes were backed off past the proper limits of adjustment, and one of the brake shoes failed to contact the brake drum by approximately 1/8 inch. The passenger of the truck revealed that the driver had stopped at least twice and adjusted the trailer brakes as it was felt that the trailer was slowing him down. The carrier stated that the power unit had been serviced less than 3 weeks before the accident and that the brakes were properly adjusted at that time. A service sticker attached to the trailer indicated that the trailer had been serviced about 4 weeks before the accident.

The investigation failed to find daily log books for the truckdriver. Consequently, no hours of service determinations were made. Witnesses to the accident related that, immediately postcrash, an occupant of the truck destroyed the log books that were being carried in the power unit.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the truckdriver's failure to stop his vehicle for a red light before entering an intersection due to a combination of alcohol impairment and improperly adjusted brakes.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Alcohol/Drugs
3. Motor Carrier Oversight of Driver
4. Motor Carrier Oversight of Equipment

CASE NO.: 51

Investigation No.: LAX-86-H-TR13
Accident Location: Forrester Road at Johnson Road near Brawley, California
Lanes: 2 lanes
Shoulders: Level dirt shoulders of varying widths
Median: None
Features: Level, flat, straight
Date and Time: May 16, 1986, 1:30 p.m.
Ambient Conditions: Clear, daylight, dry
Heavy Truck Involved: (1) 1965 White Freightliner 2-axle COE in combination with 2 loaded 24-foot trailers
Motor Carrier: Joe S. Alvarez
Type of Operation: Contract carrier, exempt
Size of Operation: 1 power unit
Heavy Truck Involved: (2) 1969 Freightliner 2-axle COE and 2 empty 24-foot trailers
Motor Carrier: Carlos G. Settle
Type of Operation: Contract carrier, exempt
Size of Operation: 1 power unit
Total Weight of Truck(s): Undeterminable due to fire
Total Length of Truck(s): (1) 65 feet
(2) 65 feet
Other Vehicle Involved: Pick-up truck
Truck Fatalities: 2 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The 1965 Freightliner was southbound on a rural 2-lane highway in the process of transporting produce from the fields to a nearby processing plant. As the vehicle approached an intersection with a private dirt road, a preceding pickup truck slowed to make a right turn. As the truck attempted to overtake the turning vehicle on the left, it struck the pickup in the rear and left side. The combination unit then continued south, entered the northbound lane, and traveled into the path of a northbound doubles combination unit. The two heavy trucks collided head-on. Investigators found 70 feet of pre impact skid from two tires of the northbound vehicle.

From the head-on impact, the power unit and first trailer of the southbound combination overturned before coming to rest approximately 100 feet south of the area of impact. The northbound combination unit was redirected northeast traveling approximately 130 feet from the area of impact before coming to rest upright. Fire began immediately in the power units.

The initial collision between the southbound combination unit and the pickup truck resulted in only minor damage to the lighter vehicle and no injuries to its driver. The collision between the heavy trucks, along with the postcrash fire, completely destroyed the power units of both vehicles. The four trailers involved received minor damage. Both truckdrivers were fatally injured.

Investigators found narcotics paraphernalia in the power unit of the southbound vehicle. A post mortem toxicology report for this driver was positive for morphine, diazepam, and nordiazepam. Although the diazepam and nordiazepam were found to be within therapeutic levels, the Safety Board could not find records of the driver being under legal drug therapy. It was determined that this driver was undergoing an alcohol abuse treatment program at the time of the accident. Additionally, the driver was operating under a "work purposes only" restriction on his license which was suspended due to a second offense drunk driving conviction.

The driver of the southbound vehicle was reportedly experienced in heavy truck operations. His family related that he had began driving the accident involved truck when he was only 16 years old, which would indicate about 8 years of experience. While it was not determined who was responsible for maintenance of the vehicle, the investigation revealed multiple defficiencies with the vehicle's tires, brakes, and mechanical components.

No record of previous heavy truck experience was documented for the driver of the northbound combination vehicle. It was found through driver history files that this driver had four moving violations in the 2 years preceding the accident. At least two of those violations involved the unsafe operation of a commercial vehicle. The investigation documented several deficiencies in the vehicle's brakes, tires, and suspension components.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this collision was the 1965 Freightliner driver's failure to see and avoid the hazard of the preceding truck. Contributing to the inability of the driver to react was impairment due to morphine and diazapam.

OF INTEREST IN THIS INVESTIGATION:

1. Alcohol/Drugs
2. Driving History
3. Motor Carrier Oversight of Equipment
4. Double Trailers

CASE NO.: 66

Safety Board Investigation No.: SEA-86-H-TR14
Accident Location: North 3rd Street at Sunset Blvd., Renton, Washington
Lanes: 5 lanes
Shoulders: None--6-inch high concrete curb
Median: None
Features: 7 to 12 percent downgrade
Date and Time: August 18, 1986, 4:13 p.m.
Ambient Conditions: Clear and daylight with dry asphalt
Heavy Truck Involved: 1981 conventional White tractor carrying a logging trailer piggyback
Motor Carrier: Delbert Carr
Type of Operation: Private carrier
Size of Operations: 1 power unit
Total Weight of Truck(s): Unknown
Total Length of Truck(s): 21 feet
Other Vehicles Involved: 1 tow truck and 7 passenger vehicles
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 7

SUMMARY:

The White tractor carrying a log trailer piggyback started down a 7 to 12 percent downgrade in fourth gear. At some point in the descent, the driver applied his brakes but discovered that the brakes would not control the truck's speed. At the bottom of the hill, the White tractor collided into a line of eight vehicles stopped for a red traffic signal.

The collision resulted in moderate damage to the power unit and moderate to substantial damage to the other eight vehicles involved. The unrestrained driver of the truck received minor injuries. Of the other vehicle occupants, eight were uninjured, five sustained minor injuries, and two received moderate to serious injuries.

The vehicle examination determined that of the three axles on the power unit, the front axle had no brakes, the second axle was not adjusted within tolerance, and the third axle was at the upper limit of proper adjustment. Both the driver and owner related that the brake adjustments are examined regularly. The owner stated that he had properly adjusted the power unit brakes only 4 days before the accident. Trip records furnished by the carrier indicated that the truck would have accumulated only about 630 miles since that maintenance. In the course of the investigation, the stopping capability of the tractor was tested at a local garage. This was accomplished by towing the accident tractor with a forklift while its brakes were applied. In this configuration, the brake wheels rolled freely. However, when the brakes were adjusted properly for the second test, the wheels locked.

This driver had 2 weeks of experience in the accident type vehicle and had received no training before his employment with the carrier. He was a long-time friend of the owner and was not subjected to a pre-employment check, a driving knowledge test, or a driving skills test. During the driver interview it was learned that the truckdriver had consumed "a beer" while dining with a relative of the truck's owner just before the accident. Witness interviews revealed that moments before the accident, the White truck ran onto a curb when it could not stop for traffic at another intersection.

The driver had began his day at 3:30 a.m. on the accident date, completing two round trips of about 180 miles up to the time of the collision, approximately 13 hours later. As the motor carrier failed to provide the requested daily time records, the driver's working hours for the past 2 weeks could not be established.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the inadequate braking capability of the truck which resulted from improperly adjusted rear brakes and the absence of front wheel brakes.

OF INTEREST IN THIS INVESTIGATION:

1. Driver Training/Experience
2. Alcohol/Drugs
3. Motor Carrier Oversight of Equipment

CASE NO.: 78

Investigation No.: DEN-87-H-TR04
Accident Location: Interstate 80, near Salt Lake City, Utah
Lanes: 6 lanes, divided
Shoulders: Median shoulder undetermined width of asphalt surface; outside shoulder 4 feet of asphalt surface
Median: Undetermined width of earthen median
Features: 6 percent winding downgrade
Date and Time: November 25, 1986, 9:40 a.m.
Ambient Conditions: Clear, daylight, dry, 35°F
Heavy Truck Involved: 1984 International COE tractor in combination with a 45-foot, fully loaded refrigerated van trailer
Motor Carrier: Treasure Valley Transportation, Inc.
Type of Operation: Common carrier
Size of Operation: 10 power units
Total Weight of Truck(s): Not determined
Total Length of Truck(s): 58 feet 4 inches
Other Vehicle Involved: None
Truck Fatalities: 1 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was traversing a mountainous downgrade traveling in the median lane of three available travel lanes. A witness reported that the vehicle was traveling at high speed and that there was smoke coming from the tractor wheels. Approximately 8 miles from the crest of the downgrade, several hundred feet after passing a runaway truck escape ramp, the combination unit overturned onto its right side, slid into a section of blocked out W-beam guardrail, and left the travel surface of the roadway. After departing the travel lanes the vehicle descended an embankment before coming to rest. From the area of overturn the combination unit traveled over 550 feet before coming to a stop. Twelve warning signs were placed between the crest of the downgrade and the accident location. In addition, a brake test area was located at the hillcrest. The downgrade was posted with a 40 mph speed limit for heavy trucks.

This accident resulted in substantial damage to both the power unit and trailer of the combination vehicle. The unrestrained driver of the truck was ejected from the cab and was later found fatally injured beneath the overturned vehicle. An authorized passenger, also riding unrestrained, sustained serious injuries. Inspection of the power unit revealed that the factory-installed restraint belt had been removed from the unit.

Although the passenger stated that the driver had used the brake check area and had manually checked the adjustment of the vehicle's brakes, a witness who was pulling onto the highway from the brake check area stated that the combination unit passed him at about 35 mph. Other witnesses reported the tractor-trailer traveling at 35 to 40 mph toward the top of the hill and then 70 to 80 mph farther down.

An examination of the combination vehicle revealed that eight of the ten brakes installed on the power unit and trailer were out of adjustment. Only the steering axle brakes were within adjustment tolerances recommended by the manufacturer. Records supplied by the motor carrier reflected that the unit's brakes had been serviced only 2 days before the accident.

This driver's daily log books were 13 days behind at the time of the accident. Reconstruction of the driver's activities, accomplished through information furnished from the motor carrier, handwritten records on a small notepad found in the power unit, and information given by the passenger, revealed that the driver had traveled approximately 1,725 miles in the 39-hour period preceding the accident. At the time of the accident the driver was 4 hours behind for a scheduled delivery and was approximately 15 miles from his destination.

This driver had reportedly accumulated 6 years of experience in the operation of heavy trucks. He had been operating the accident vehicle for the entire 2-month period of employment with the motor carrier. A search of driving history files found that he had been cited for five traffic violations in the past 3 years, however, only one of those had been reported to the carrier.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was a combination of the improperly adjusted brakes, the driver's failure to inspect the brakes at the brake check area, and the failure of the driver to use the escape ramp provided.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Driving History
3. Motor Carrier Oversight of Driver
4. Motor Carrier Oversight of Equipment

CASE NO.: 80

Investigation No.: LAX-87-H-TR02
Accident Location: Interstate 15 near Barstow, California
Lanes: 4 lanes, divided
Shoulders: Median shoulder 3-foot asphalt surface, outside shoulder 8-foot asphalt surface
Median: 40-foot earthen median
Features: Straight, at grade
Date and Time: December 3, 1986, 1:40 a.m.
Ambient Conditions: Clear, dark, and dry
Heavy Truck Involved: 1971 White Freightliner COE tractor in combination with 2 loaded tank trailers
Motor Carrier: Hilgo Transport, Inc.
Type of Operation: Contract carrier
Size of Operation: Not determined
Total Weight of Truck(s): 77,880 pounds
Total Length of Truck(s): Not determined
Other Vehicle Involved: None
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The doubles combination, hauling 8,400 gallons of molten sulfur, struck a berm at the right road edge with the rear trailer. The tractor and trailers veered across the outside lane into the median lane where the rear trailer overturned and ruptured upon impact. The driver stated that he brought the vehicle to a stop, exited the vehicle, and noticed a blue flame emitting from the area of the spill. The sulfur had ignited, causing a toxic cloud to spread from the scene across the open desert. The highway was closed in both directions for nearly 10 hours, but evacuation was not necessary because of the rural, unpopulated area.

The unrestrained driver was not injured, nor were there any injuries to the emergency response personnel. The rear trailer was destroyed in the fire and the first trailer was severely damaged. Minor fire damage was noted to the tractor. There was severe damage to the roadway resulting from the intense fire, requiring extensive resurfacing before the traffic lanes could be reopened.

The investigation revealed several defects with the mechanical components of the power unit and semitrailer. These defects included out-of-adjustment brakes, deteriorated and leaking air service lines for the brakes, excessive contaminants in the air tanks for the brake system, broken suspension parts, and multiple deficiencies with the vehicle's lighting system.

While the total experience for the 21-year-old truckdriver was not determined, it was found that in the past 3 years he had received 13 citations while operating a commercial vehicle and had one accident. The driver related that he had no formal training in heavy truck operations or in the transportation of hazardous material. While the driver stated to investigators that he did not maintain a daily log, a driver's log book was found in the power unit cab. That log book was 30 days behind. The driver reported to the California Highway Patrol that he had been on duty for 12 hours before the accident. Investigators at the accident site observed that the driver appeared to be in "a sleepy/fatigued" condition.

OTHER INFORMATION:

Molten sulfur is not regulated as a hazardous material according to the CFR, in spite of the fact that it is transported at 290°F. in order to maintain the liquid state. As a result of this investigation and two investigations of similar accidents, a Safety Board recommendation was issued to regulate the transportation of molten sulfur as a hazardous material.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the driver's failure to perceive that his vehicle was leaving the roadway as a result of fatigue.

OF INTEREST IN THIS INVESTIGATION:

1. Driver Training/Experience
2. Fatigue/Duty Hours
3. Driving History
4. Motor Carrier Oversight of Driver
5. Motor Carrier Oversight of Equipment
6. Hazardous Material
7. Double Trailers

CASE NO.: 83

Investigation No.: SEA-87-H-TR03
Accident Location: Walnut Street crossing of Burlington Northern railroad track at mile post 71.43, Winlock, Washington, DOT # 0924935
Lanes: 2 lanes
Shoulders: Unimproved dirt
Median: None
Features: +14 percent grade to tracks
Date and Time: December 22, 1986, 1:36 p.m.
Ambient Conditions: Raining, daylight, wet
Heavy Truck Involved: 1982 Freightliner COE 3-axle tractor in combination with a fully loaded 48-foot 3-axle trailer
Motor Carrier: M & M Transport, Inc.
Type of Operation: Common carrier
Size of Operation: 11 power units
Total Weight of Truck(s): 78,400 pounds
Total Length of Truck(s): 58 feet
Other Vehicle Involved: Amtrak passenger train
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 3

SUMMARY:

A combination unit loaded with wood chips in a low-clearance trailer approached a high-profile railroad grade crossing. The driver reported that as he attempted to cross the tracks the truck stopped abruptly and he was unable to move either forward or backward. The driver had been unable to free the vehicle when the grade crossing protection gates came down. He radioed his company and exited the truck. Within 2 1/2 minutes from the time the driver stopped on the tracks, the tractor and trailer were impacted near the fifth wheel by a passenger train. The train was powered by two engines and pulling 11 cars. A speed tape recovered from the lead engine indicated an impact speed of 51 mph. There were 14 crewmembers and 457 passengers on the train. The impact pushed the tractor 168 feet down the tracks and the detached trailer 50 feet.

The truck was destroyed by the impact. Both engines and four cars of the train were derailed. Two passengers and one crewmember sustained minor injuries.

The investigation revealed that the clearance allowable at the lowest point on the trailer (12 inches) was insufficient to allow the trailer to clear the high profile grade crossing at the angle of approach elected by the driver. Although the driver had taken this route before, it is probable that this approach was made from a different angle. He had made approximately 100 previous crossings of the railroad tracks before the accident date--about 10 to 12 of those crossings made in the accident type vehicle.

The truckdriver reported 4 years experience in the operation of heavy trucks. Although he had been employed by the motor carrier for about 8 months, he had only 3 weeks of experience in the accident involved combination unit. The driver's record indicated a total of four violations in the past 5 years, including a recent negligent driving and a citation for 52 mph in a 35 mph zone. None of the violations were reported to the motor carrier.

The investigation also found that four of the combination unit's ten brakes were out of adjustment at the time of the accident. Maintenance of the vehicle's components was the responsibility of the motor carrier, who related that each vehicle is inspected and maintained every 5,000 miles.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the truckdriver's failure to negotiate the high-profile crossing at the proper angle to clear the low-clearance trailer.

OF INTEREST IN THIS INVESTIGATION:

1. Driver Training/Experience
2. Motor Carrier Oversight of Driver
3. Motor Carrier Oversight of Equipment
4. Grade Crossing
5. Environment

CASE NO.: 84

Investigation No.: CHI-86-H-TR11
Accident Location: West Main at Chipman St., Onosso, Michigan
Lanes: 4 lanes, undivided
Median: None
Features: Intersection
Date and Time: May 10, 1986, 10:24 a.m.
Ambient Conditions: Clear, daylight with dry pavement
Heavy Truck Involved: 1975 conventional Brockway tractor in combination with a loaded 3-axle dump trailer
Motor Carrier: Chippawa Redimix Concrete & Construction Company
Type of Operation: Private carrier
Size of Operation: 1 operating tractor trailer, 3 three-axle cement mixer trucks
Total Weight of Truck(s): 79,300 pounds
Total Length of Truck(s): Approximately 40 feet
Other Vehicle Involved: Passenger car
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 1 Other Injuries: 0

SUMMARY:

The combination vehicle was eastbound approaching a signalized intersection. The driver stated that he had a green light for his lane as he traveled over a grade crossing 477 feet west of the intersection at approximately 25 mph. The truckdriver estimated his speed at 30 mph as he reached the intersection and a westbound passenger car turned left (south) in front of the truck. The truck tractor collided into the right side of the passenger car. The truck pushed the passenger car approximately 47 feet into a wooden utility pole, severing the pole before coming to rest. The tractor of the combination vehicle came to rest partially on top of the passenger car at the southeast corner of the intersection.

The collision resulted in substantial damage to the right front of the tractor but only minor injuries were reported by the truckdriver. The passenger car was destroyed and its driver sustained fatal injuries.

The driver stated that he observed the passenger vehicle turning across his path approximately 100 feet before the impact. A postaccident examination of the combination vehicle revealed multiple defects with including inoperative brakes on the tractor-trailer. A hand valve on the airbrake system supply hose of the trailer, used for a second trailer (pup trailer, when present), was found open. This open valve allowed air brake system pressure to escape. Several of the tires on this vehicle were unsafe. The owner of this combination vehicle stated there was no maintenance program in effect for the vehicle. All maintenance was performed on an as-needed basis either by the owner or by a person employed by the owner. The trailer had not been in service for the 6 months preceding the accident.

The truckdriver claimed to have approximately 10 years of occasional experience with heavy truck operations. He was not a full-time truckdriver--he worked as a heavy equipment operator. For the past several years his only truck driving duties had involved moving heavy equipment from one local job site to another.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the passenger car driver to yield to oncoming traffic when making a left turn. Contributing to the severity of the accident was the reduced braking efficiency of the combination vehicle.

OF INTEREST IN THIS INVESTIGATION:

1. Motor Carrier Oversight of Equipment

CASE NO.: 93

Investigation No.: DEN-86-H-TR16
Accident Location: U.S. Highway 550, 1/2 mile south of Silverton, Colorado
Lanes: 2 lanes
Shoulders: 18-inch wide asphalt shoulder
Median: None - Double yellow center stripe
Features: Downgrade with winding curves
Date and Time: September 12, 1986, 12:20 p.m.
Ambient Conditions: Clear, daylight with dry pavement
Heavy Truck Involved: 1984 Conventional Peterbilt tractor in combination with a loaded 45-foot trailer
Motor Carrier: R & D Harris Transportation, Inc.
Type of Operation: Common carrier
Size of Operation: 14 power units
Total Weight of Truck(s): 81,660 pounds
Total Length of Truck(s): 65 feet
Other Vehicle Involved: 1966 MCI 47 passenger bus
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 4 Other Injuries: 12

SUMMARY:

The combination unit, 1660 pounds overweight, was northbound, traversing a mountainous area on U.S. Highway 550 near Silverton, Colorado, when the brakes began to overheat. It should be noted that the highway had numerous warning signs concerning curves, steep grades and reduced speed limits. The driver had just descended Coal Bank Hill Pass and stopped for 20 minutes to allow his brakes to cool. He then began to descend Molas Pass, an 8-mile, 7-percent winding downgrade. At a point about halfway down the pass the unit's brakes began smoking, and the driver stopped for another 30 minutes to allow his brakes to cool and to re-adjust them. He then began to descend the remainder of the pass in third or fourth gear. Near the bottom of the pass he lost all braking capability and began accelerating out of control. The unit entered a 114-foot radius curve to the right, and overturned, taking up both lanes. The unit then slid 110 feet on its left side and collided with a southbound passenger bus that was in the right lane. The impact forces pushed the coach bus backwards approximately 26 feet from the initial contact area.

The combination unit and bus sustained substantial damage, and four bus occupants received fatal injuries. Twelve additional bus passengers received minor to serious injuries. The truckdriver was uninjured.

An examination of the combination unit's brakes disclosed that the left brake on the second axle was inoperative, the left brake on the fourth axle was inoperative, and both brakes on the fifth axle were improperly adjusted. These deficiencies left only six of the available ten brakes in proper working order. During the National Transportation Safety Board interview, the driver admitted that he was having brake problems, but when he had informed his supervisor about the problem, his supervisor said not to worry about it, that they would be fixed when the unit returned from Colorado.

When interviewed, the supervisor denied receiving any report of brake problems before the driver left the carrier's yard. The state of disrepair of the brake system indicated a longstanding problem, not one that could have occurred on this trip.

With 15 total years of experience in the operation of heavy trucks, the Peterbilt driver's only training had been acquired on the job. He had been employed by the carrier for about 3 weeks, and was making his third trip when the accident occurred. The driver stated he had mountainous driving experience, but this was the first time he had driven this route. A search of this driver's record revealed that he had been cited for at least ten moving violations in the 4-year period preceding the accident. On the driver's undated employment application furnished by the motor carrier, the driver certified only one violation had been committed for the past 3 year period. (Seven of the ten violations were committed in this 3-year period)

The Safety Board investigation revealed that the truckdriver had accumulated less than 7 hours of sleep in the 51 hours preceding the collision. He had started his activities on Wednesday, the 10th of September, at 8 a.m., working at the carrier's yard until 4 p.m. He began driving at 5 p.m. on that date, traveling all night and covering more than 450 miles in approximately 13 hours, before stopping because of mechanical problems. The necessary repairs took 7 hours; however, the driver was unable to sleep uninterrupted because of noise and cab movement during the repairs. After leaving the repair facility, he drove for 4 hours, went off duty for 3 hours, and then drove an additional 200 miles in approximately 3 hours before stopping for 1 1/2 hours. Unable to sleep, he began driving again, continuing until the accident occurred at 12:20 a.m. Approximately 100 miles remained before he would have reached his destination, and he was 3 1/2 hours late for his scheduled delivery. At the time of the accident, he had been without sleep for over 20 1/2 hours. A codriver, his wife, who was supposed to share driving duties was not onboard the unit for any part of the trip. However, the daily logs of the codriver were found in the power unit, signed, but driving and off duty history were not filled out for the dates of the accident trip.

Further investigation found that this driver was unfamiliar with the mountainous route where the accident occurred. The driver had, however, passed several advisory signs prior to the collision which indicated the hazardous nature of the roadway.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the fatigued truckdriver's decision to continue a descent on a very steep mountain roadway, knowing that his truck brakes were not properly maintained. This resulted in a loss of speed control, the overturn, and subsequent collision with the bus. Contributing to the accident was the carrier's failure to maintain the truck's brakes.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Driving History
3. Motor Carrier Oversight of Driver
4. Motor Carrier Oversight of Equipment

CASE NO.: 96

Investigation No.: LAX-86-F-H008
Accident Location: Eastbound Interstate 10, near Colton, California
Lanes: 8 lanes, divided
Shoulders: 6-foot asphalt on right, 10-foot asphalt on left
Median: W-beam barrier
Features: At grade, straight, level
Date and Time: April 13, 1986, 3:04 p.m.
Ambient Conditions: Clear, dry, daylight
Heavy Truck Involved: 1981 White Freightliner COE 2-axle tractor in combination with 2 fully loaded tank trailers
Motor Carrier: Farmdale Creamery
Type of Operation: Exempt carrier
Size of Operation: 3 power units
Total Weight of Truck(s): 79,000 pounds
Total Length of Truck(s): Not determined
Other Vehicle Involved: Four passenger cars
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 3

SUMMARY:

A combination unit was eastbound in the slow lane of an interstate highway at a witness-estimated speed of approximately 50 mph. The driver related that he observed traffic slowing ahead and applied his brakes approximately 200 feet back but that his vehicle failed to slow sufficiently to avoid impacting the vehicles ahead. Witnesses reported that before the impact, the truck had moved into the second and third lanes. The unit struck four vehicles and then overturned in the roadway.

The truck sustained major damage. The unrestrained driver sustained minor injuries. The four passenger vehicles also sustained major damage resulting in three minor injuries.

The driver stated that he had not noticed the loss of braking ability until he attempted an emergency stop. He further stated that he had completed a brief pretrip examination but had not noticed any problems. The investigation revealed that the brake shoes on axle No. 5 had been improperly installed when the roller cam was reinstalled below the S-cam, precluding any contact between the brake shoe and the drum. Records furnished by the motor carrier indicated that the brakes on the No. 5 axle had been replaced 4 days before the accident and that the combination unit's brakes had been adjusted on the day before this accident. The motor carrier also revealed that all vehicle maintenance is performed by the carrier at their facilities.

The State highway patrol conducted an audit of the carrier approximately 5 months before this accident. Two power units and four trailers were inspected. The examination found four brake violations, two suspension violations, two steering violations, and two tire violations. That audit had resulted in an unsatisfactory compliance rating, however, approximately 3 weeks before this accident the carrier's rating was upgraded to satisfactory.

The driver reported 15 years of experience with heavy trucks. He had been employed by the carrier for 4 years and had been driving the accident involved vehicle for the past 3 years. At the time of the accident he had been on duty for approximately 10 1/2 hours.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the inability of the truckdriver to stop his vehicle for traffic congestion due to a delayed response and defective brakes.

OF INTEREST IN THIS INVESTIGATION:

1. Motor Carrier Oversight of Equipment
2. Double Trailers

CASE NO.: 115

Investigation No.: CHI 87-H-TR05
Accident Location: Interstate 70, East St. Louis, Illinois
Lanes: 3 lanes
Median: None
Features: Elevated
Date and Time: December 4, 1986, 2:54 p.m.
Ambient Conditions: Clear, dry, daylight
Heavy Truck Involved: (1) 1977 COE International tractor in combination with a loaded dump trailer
Motor Carrier: J.C. Hauling Company
Type of Operation: (1) Contract carrier
Size of Operation: (1) 50 power units
Heavy Truck Involved: (2) 1977 COE International tractor in combination combination with an empty flatbed trailer
Motor Carrier: ABC Trucking
Type of Operation: (2) Common carrier
Size of Operation: (2) 200 power units
Total Weight of Truck(s): (1) 70,680 pounds
(2) 27,070 pounds
Total Length of Truck(s): (1) Not determined
(2) 54 feet
Other Vehicle(s) Involved: 2 Passenger cars
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 1 Other Injuries: 1

SUMMARY:

The loaded International dump trailer combination was eastbound on Interstate Highway 70 in the left of three lanes at a witness-estimated speed of 55 mph when a passenger car reportedly made an abrupt lane change maneuver and then slowed down, causing the International driver to steer into the center lane. Traffic in the center and right lanes slowed, and the International dump trailer combination failed to stop, colliding into the rear of a 1977 Chevrolet.

The Chevrolet was pushed about 38 feet from the initial impact area to where it was forced into the rear of the International flatbed combination unit. These units continued being pushed forward until the flatbed combination struck the rear of a 1986 Pontiac.

The collision resulted in minor damage to both combination units while the Chevrolet was crushed extensively. The unrestrained Chevrolet driver received fatal injuries, and the unrestrained right front seat passenger received serious injuries. The Pontiac sustained substantial damage. The Pontiac driver and both truckdrivers reported no injuries.

The International dump trailer combination unit's right side fifth axle began leaving skidmarks in the left lane 494 feet from where the unit came to rest.

A subsequent examination of the brakes of this combination unit disclosed only 2 of 10 brakes were in working order. The following brake system defects were noted.

> The brake pads on the steering axles were contaminated with oil, and the air hoses were dry rotted and cracked, allowing air to leak from the system. The left chamber of the second axle leaked air and the right side brake pads on the second axle failed to contact the drum during a full air application test. The brakes on the third axle, both sides, were inoperative--the pads failed to move during a full air application.
>
> There was no brake lining on the left side of the fourth axle, and the push rod travel on the type 24 brakes was 2 3/4 inches. During a full air test, it was noted that the system lost 13 psi per minute and could not maintain 30 psi at engine idle speed.

BMCS files reflected that this carrier had a satisfactory rating even though it had never been audited by inspectors. Moreover, the files showed that this carrier's trucks had been inspected in the field on 50 occasions, resulting in 474 violations in 6 months. An examination of the motor carrier by the Safety Board revealed that the carrier neither inspects nor requires its drivers to inspect the owner-operated vehicles of the fleet for equipment deficiencies.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the improperly maintained brakes on the International combination which were the result of the motor carrier's inadequate maintenance practices.

OF INTEREST IN THIS INVESTIGATION:

1. Motor Carrier Oversight of Equipment

CASE NO.: 121

Investigation No.: LAX-86-H-TR16
Accident Location: Interstate 110, inside Los Angeles, California
Lanes: 8 lanes, divided
Shoulders: Median shoulder 10 feet of asphalt, outside shoulder 6 feet of asphalt
Median: 10-foot asphalt surface with New Jersey type concrete barrier in center
Features: Straight, 2 percent downgrade
Date and Time: August 30, 1986, 3:20 p.m.
Ambient Conditions: Clear, daylight, and dry
Heavy Truck Involved: 1981 Kenworth conventional 3-axle tank truck in combination with a loaded tanker pull trailer
Motor Carrier: Don Keith Trucking
Type of Operation: Common carrier
Size of Operations: 99 power units
Total Weight of Truck(s): Undetermined
Total Length of Truck(s): Undetermined
Other Vehicle(s) Involved: 2 passenger vehicles
Truck Fatalities: 1 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 1

SUMMARY:

The combination unit was traveling at a witness-reported speed of 50 to 52 mph on a slight curve to the right when the left front tire failed. The trailer began to whip back and forth, and then both the tractor and trailer veered to the left across two lanes at an angle of about 10^{0} for 294 feet. When the left side of the tractor struck the concrete barrier, the trailer climbed up and over the wall into the oncoming lanes of traffic. The tractor overturned and continued along the barrier partially resting on the barrier and ejecting the driver. As the tractor was sliding to rest still pulling the trailer across the barrier, a passenger vehicle struck the trailer and glanced off another passenger car. Because of the abrasive action of the concrete barrier rubbing on the attachment points, the tank came off the chassis of the tractor as the combination unit slid about 350 feet along the barrier.

Both the tractor and trailer were extensively damaged. The cab was crushed on the top left and side with much of the outside structure torn away. There was no survivable space around the driver's seating position. The unrestrained driver was ejected and crushed between the tractor and the concrete barrier.

The restrained driver of the passenger car that struck the trailer was seriously injured, and his car received moderate damage. The other involved passenger vehicle also received moderate damage. None of five restrained occupants were injured.

An examination of the left front tire revealed that the tire failure occurred before impact. Records at the carrier showed that the tire had about 90,000 miles, and measurements showed 10/32 inch of tread. An examination of the vehicle found 3 of the 4 tractor brakes out of adjustment. The trailer brakes were not checked because they had been backed off to remove the trailer from the accident scene. On the third axle of the tractor, three of the eight spring hanger bolts were loose.

The operator of the combination unit had no accidents and only one violation in the past 3 years. No other information concerning the driver's experience and training was available because of the carrier's lack of cooperation.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the explosive failure of the truck's steering axle tire. Contributing to the severity of the accident was the failure of the median barrier to keep the combination unit on its own side of the roadway.

OF INTEREST IN THIS INVESTIGATION:

1. Motor Carrier Oversight of Equipment
2. Crashworthiness
3. Environment

CASE NO.: 128

Investigation No.: FTW-87-H-TR05
Accident Location: FM 60 at East Frontage Road to State Highway 6 in College Station, Texas
Lanes: 2 lane, 2 direction
Shoulders: West shoulder 4-foot wide asphalt, east side, no shoulder
Median: None
Features: At intersection
Date and Time: March 17, 1987, 3:35 p.m.
Ambient Conditions: Clear, daylight, dry asphalt
Heavy Truck Involved: 1973 COE Kenworth tractor in combination with an empty 40-foot flatbed trailer
Motor Carrier: Bilbo Freightlines, Inc.
Type of Operation: Common carrier
Size of Operation: 150 power units
Total Weight of Truck(s): 24,000 pounds
Total Length of Truck(s): Not determined
Other Vehicle Involved: 1980 Oldsmobile Cutlass
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 2 Other Injuries: 0

SUMMARY:

The Kenworth combination unit was traveling north on the frontage road to State Highway 6 at approximately 35 to 40 mph when it passed a passenger vehicle in a no-passing zone, ran the red light at FM 60, and collided into the right side of a 1980 Oldsmobile that was eastbound on FM 60. From the initial impact area, the Kenworth combination unit pushed the Oldsmobile approximately 55 feet to where the left side of the Oldsmobile struck a traffic signal pole. The combination unit then overrode and came to rest on top of the Oldsmobile.

The collision resulted in substantial damage to the combination unit and the Oldsmobile was destroyed. The lapbelt-restrained Kenworth driver received a minor head injury. Both the lap/shoulder belt restrained driver and the right front seat passenger of the Oldsmobile received fatal injuries.

This motor carrier's safety inspectors checked all vehicles of the fleet monthly to ensure that all trucks had proper brake adjustments. The records showed that this vehicle had missed its last required inspection and was approximately 1 month overdue for its brake inspection. During the examination of the Kenworth truck, it was found that the brakes were not adjusted properly on the second and third axles--the push rod stroke on the second axle was 2 5/8 inches on both sides and 2 1/2 inches on both sides of the Third axle. The front steering axle was not equipped with brakes.

The driver had 5 years experience in operating heavy trucks. The driver had never attended a formal driver training school; however, he did receive training during annual safety meetings required by the motor carrier.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the driver to stop for a red traffic signal as a result of inattention, degraded brake performance, or an intentional attempt to enter and cross the intersection before the light changed from yellow to red.

OF INTEREST IN THIS INVESTIGATION:

1. Motor Carrier Oversight of Equipment

CASE NO.: 132

Investigation No.: MKC-87-H-TR12
Accident Location: Interstate 35, milepost 205.9, Gardner, Kansas
Lanes: 4 divided
Shoulders: Inside shoulder 7-foot, outside shoulder 10-foot
Median: Undetermined width of earthen median
Features: Straight with rolling hills
Date and Time: May 2, 1987, 9:45 a.m.
Ambient Conditions: Clear, dry and daylight
Heavy Truck Involved: 1978 Ford conventional tractor in combination with a loaded Trailmobile flatbed trailer
Motor Carrier: Magill Truck Lines
Type of Operation: Common carrier
Size of Operation: 45 power units
Total Weight of Truck(s): 73,400 pounds
Total Length of Truck(s): 51 feet
Other Vehicle Involved: Chevrolet Van
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 6 Other Injuries: 4

SUMMARY:

The combination unit was northeast bound in the outside lane when it was struck in the rear by a Chevrolet van. The van left 28 feet 10 inches of one wheel skid before impact and 3 feet 8 inches after impact. The van then separated from the semitrailer and slid 29 feet 4 inches before stopping. After impact, the combination unit came to a stop in 114 feet. The driver of the combination unit stated that he was experiencing trouble with the power unit and was traveling between 35 and 40 mph. The driver also stated that he did not know if the hazard warning flashers were on at the time of the accident because he had been turning them on and off to keep them from over heating.

At approximately 8 a.m. on the morning of the accident, the truckdriver contacted his company dispatcher and reported that he was experiencing trouble with the power unit not having enough power to pull his load faster than 40 mph. The company official told him to keep on going because he had to be at Lenexa, Kansas, before noon to unload.

This accident resulted in no damage to the power unit and only minor damage to the trailer. The passenger vehicle was destroyed by the impact. The unrestrained driver of the combination unit sustained no injuries. The unrestrained driver of the van and five passengers died; four other passengers in the van sustained serious injuries.

The driver of the combination unit related a total of 24 days experience operating heavy trucks, not including the truck driving school he had attended. He had been employed by the motor carrier only 4 days at the time of the accident. Daily log records reflected no entries for the last 2 days. Investigation also revealed that the truck had averaged approximately 29 mph for the 51 miles immediately preceding the collision.

The bottom brakeshoe of the third axle was not in contact with the brakedrum when the brake was applied and the third axle wheel rim was cracked. On the semitrailer, there was no front end structure to prevent shifting of the load to the front.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was the inattention of the driver of the Chevrolet van. Contributing to the accident was the requirement by the company for the truckdriver to continue his trip even though the power unit could not maintain the minimum speed limit.

OF INTEREST IN THIS INVESTIGATION

1. Driver Training/Experience

2. Motor Carrier Oversight of Driver

CASE NUMBER: 134

Investigation No.: CHI-87-H-TR09
Accident Location: Illinois Route 53 at Army Trail Road in Addison, Illinois
Lanes: 2 lanes, ⊄ direction
Median: None
Features: Straight roadway with a slight downgrade
Date and Time: January 24, 1987, 1:10 p.m.
Ambient Conditions: Clear, dry, daylight, about 20°F
Heavy Truck Involved: 1976 Peterbilt cabover tractor in combination with a 1973 Obrecht flatbed trailer
Motor Carrier: Area Interstate Trucking, Inc.
Type of Operation: Common carrier
Size of Operation: Between 20 and 200 tractors (The driver was working for 3 carriers.)
Total Weight of Truck(s): 82,430 pounds
Total Length of Truck(s): 34 feet 3 inches (approximate)
Other Vehicles Involved: None
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was southbound on Illinois Route 53, a four-lane divided highway that terminates at Army Trail Road in Addison, Illinois. The combination was in the right lane of the two-lane exit ramp for Army Trail Road traveling at a driver-stated speed of 35 to 40 mph. The driver stated that as he approached traffic stopped at the intersection, he applied the truck's brakes and discovered they would not activate. He then steered the unit off the roadway to the right to avoid the stopped traffic. The combination departed the right side of the roadway over a cement curb and onto the snow covered roadside, traveling about 103 feet before impacting a storm water drainage pipe. The power unit and trailer remained upright, but the power unit cab broke away from the frame and laid over on its left side. The trailer's load of steel, secured with chains and binders, broke away, rolled forward, and struck the trailer's bulkhead. The bulkhead fractured at the trailer base and laid forward onto the truck frame. Investigation of the accident scene disclosed that the combination unit's tires were rolling, not skidding.

The combination unit and its load of metal products were destroyed in the accident. The unrestrained driver of the combination stated he was not injured in the accident.

A subsequent examination of the combination unit disclosed numerous defects throughout the mechanical system, including several defects in the brake system. The driver, who was also the owner, maintained and serviced his equipment. He stated that he repairs and adjusts the brakes on his trucks, usually backing off the trailer brakes a little to prevent control problems while hauling in a double bottom configuration. The carriers employing the driver and his unit are also required on trip leases to pretrip inspect the tractor and trailer. Copies of the inspections supplied by the carriers indicate the unit was inspected and no defects were found.

The driver of the overweight combination unit was operating the truck with a suspended Indiana chauffeur's license. His current license suspension is one of three incurred from 1981 through 1987. His Indiana driving record includes the following offenses:

1. A conviction for leaving the scene of an accident;

2. A conviction for reckless driving;

3. A conviction for driving with a suspended license; and

4. Four unpaid speeding citations.

The driver had about 7 years of experience operating heavy trucks, and was trip-leased by one of three motor carriers at the time of the accident. Log book entries obtained from all three carriers indicate the driver was on duty between 33.5 and 36.5 hours in a 72-hour period prior to initiating the accident trip lease--a violation of the 15-hour on-duty regulation.

Information obtained from the three motor carriers the driver leased or trip leased to show he was operating on short term leases of 29 days or less. None of the three carriers had done a background or license check on the driver.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the driver's failure to adjust and maintain the vehicle's braking system.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours

2. Driving History

3. Motor Carrier Oversight of Driver

4. Motor Carrier Oversight of Equipment

CASE NO.: 140

Investigation No.: ATL-87-H-TR15
Accident Location: US 1 and Kings Mill Drive, in Fredericksburg, Virginia
Lanes: 4
Shoulders: None inside, 6 feet gravel outside
Median: Grass, depressed, 21 feet wide
Features: Tangent roadway, long vertical sag through a T-intersection
Date and Time: April 8, 1987; 3:20 p.m.
Ambient Conditions: Clear, sunny, and dry
Heavy Truck Involved: 1978 Chevrolet power unit and semitrailer (car-hauler) with cargo of 8 automobiles
Motor Carrier: Anchor Motor Frieght, Inc.
Type of Operation: Common carrier
Size of Operation: 3,000 power units
Total Weight of Truck(s): 65,000 pounds
Total Length of Truck(s): 55 feet
Other Vehicle Involved: 1975 Thomas 66-passenger schoolbus with 35 students aboard
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 36

SUMMARY:

A southbound combination unit crashed into the rear of a public schoolbus. The bus was stopped in the right traffic lane of the southbound two-lane roadway to off-load one of the 35 student passengers aboard; its emergency lights and brake lights were activated. The back of the schoolbus driver's seat collapsed and the lapbelted driver was thrown rearward several feet. As the schoolbus moved forward out of control, the seriously injured driver returned to the front and managed to stop the bus. The bus came to rest on the right shoulder of the roadway about 300 feet from the area of impact. Extensive damage was sustained by the bus--maximum deformation in the rear measured 44 inches. Four students seated in the rear of the schoolbus were seriously injured, the remaining 31 passengers sustained minor injuries.

The power unit continued southward to a final rest position partially in the right traffic lane and on the shoulder. The front of the power unit and an automobile being transported on its top were damaged. In the accident sequence, the lower fifth wheel plate was torn from the tractor frame causing the front of the semitrailer to impact the rear of the power unit. The rear of the power unit cab and two automobiles on the front of the trailer were damaged. The lapbelted truckdriver sustained minor injuries.

The roadway on the approach to the accident site is tangent with a vertical curve. A moderate descending grade begins about 1/2 mile away with the sag of the vertical curve located about 1/10 mile from the accident site. Sight distance between the beginning of the grade and the accident site was unobstructed.

Some skidmarks that were identified as belonging to the combination were found at the accident site. Skidmarks of the rear tires of the power unit measured about 111 feet for the left side and 81.5 feet for the right side. About 20 feet of the left skidmarks were preimpact; no other preimpact skidmarks were found. The only skidmarks of the trailer measured about 10.5 feet to final rest position of the left rear tires.

A postcrash inspection of the combination unit included a finding that the brake chamber push rod measurements at all wheels of the semitrailer exceeded readjustment limits. The brake chamber diaphragm at the right front was ruptured with oil and grease present in the chamber--signs of little friction between brake pads and drum. Also, records of the motor carrier documented several instances where the combination unit driver had reported brake system defects and subsequent repairs at the company shop.

At the time of the accident, the truckdriver reportedly had traveled about 415 miles in 8 3/4 hours. This computed to an average speed of over 47 mph traveling over some mountainous and heavy traffic volume highways.

At the time of the accident, the truckdriver was licensed in both Maryland and Virginia. The motor carrier formally discharged the truckdriver on May 6, 1987. Upon appeal in accordance with union contract, the discharge was reduced to a 6-week suspension, and the truckdriver returned to work on May 26, 1987. In Fredericksburg General District Court on July 17, 1987, the truckdriver was found guilty of reckless driving as a result of the accident. The sentence included a 6-month suspension of his driver's license. The suspension was subsequently documented in his Virginia driver license record. In late November 1987, the Virginia license submitted by the Court was being held in State files. No record of the conviction or suspension was found in his Maryland driver's license record. The driver qualification file as maintained by the motor carrier documented the truckdriver's Maryland license only both for periods of employment before the accident and after his license suspension by Virginia. In early December 1987, a management representative of the motor carrier responded to a Safety Board inquiry on the truckdriver's status by stating that he was working regularly as an over-the-road driver and that his driver qualification file documented a Maryland driver license. The representative was specifically advised by the Safety Board of the suspension by Virginia, to which the representative expressed a lack of prior knowledge and an assurance that corrective action would be taken. The foregoing information was referred to the OMCS.

The schoolbus, owned and operated by Fredericksburg City Public Schools, was transporting 35 students of the Walker-Grant Intermediate School. The busdriver had several years of experience and was a certified schoolbus driver and trainer. Postcrash inspection of the schoolbus revealed that its emergency lights and brake lights were activated at the time of the accident. No preaccident defects were found.

Fredericksburg, Virginia
Case No. 140

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the truckdriver to observe and avoid the stopped schoolbus. The reason(s) for that failure could not be determined. Contributing to the severity of the accident was the defective brakes of the combination unit due to inadequate maintenance by the motor carrier and separation of the semitrailer from the tractor in the accident sequence.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Driving History
3. Motor Carrier Oversight of Equipment

CASE NO.: 142

Investigation No.: LAX 87-H-TR05
Accident Location: Eastbound SR 60 near Brea Canyon Road,
Diamond Bar, California
Lanes: 8
Shoulders: 5-foot asphalt paved shoulder
Median: 10-foot wide asphalt with integral
concrete redirecting barrier
Features: At grade, 6,000 foot radius curve
to right, 0.2 percent upgrade
Date and Time: March 7, 1987, 8:55 a.m.
Ambient Conditions: Daylight, cloudy, dry
Heavy Truck Involved: 1970 Peterbilt conventional tractor in combination
with a partially loaded 46-foot trailer
Motor Carrier: Banovac Transportation, Inc.
Type of Operation: Common carrier
Size of Operation: 3 power units
Total Weight of Truck(s): Not determined
Total Length of Truck(s): 67 feet
Other Vehicle(s) Involved: 6 passenger vehicles
Truck Fatalities: 0 Truck Injuries: 2
Other Fatalities: 2 Other Injuries: 13

SUMMARY:

The combination unit was eastbound in the third lane when traffic ahead began to slow and stop for a prior collision. The combination unit driver reported his speed to be 50 to 60 mph when, in an attempt to avoid a stopped vehicle ahead, the driver turned to the right. As he did, he impacted and overrode the rear of a passenger vehicle, severely damaging the right rear of the passenger vehicle. The truck then clipped the left front fender of a pickup truck. As it continued eastbound and began to arc into the center divider, it impacted and overrode the left rear of another passenger vehicle, killing the two occupants. At this point, evidence indicates that the combination unit began to overturn onto its right side. As it did so, it impacted and severely intruded into the left rear of a small station wagon, causing serious injuries to the left side passengers. The unit then slightly impacted the vehicle which had precipitated the original slow down. The station wagon then struck the center median and rolled over into the traffic lanes. The vehicle was unoccupied at this time because the occupants had fled after the initial accident. The combination unit continued on its side and impacted the rear of a sixth passenger vehicle causing major damage to the rear of the vehicle.

The collision resulted in moderate damage to the left front and right side of the combination vehicle. The unrestrained occupants complained of back and neck strain. Five of the passenger vehicles were destroyed. Two of the occupants were fatally injured, 2 sustained serious injuries, and 11 sustained minor injuries.

Two of the four service brakes on the tractor were out of adjustment and that all drums exhibited minor heat checking on the surfaces. The inspection of the trailer revealed that three of the four service brakes were out of adjustment. An inspection of the scene failed to discover any evidence of precrash braking.

Toxicological examination of the combination unit driver revealed a 0.10 percent BAC level. Extrapolating back to the time of the accident renders a probable at-crash BAC level of 15-17 percent. During an interview, the passenger in the combination unit revealed that he had been with the driver since approximately 10 p.m. on the night before the accident. He had noticed that the driver was in an "angry" mood and observed him drinking from a bottle in the vehicle. As they continued on their delivery route, the driver reportedly drove in an erratic manner. When the passenger called the dispatcher for the company to report the driver's behavior, he was told to "mind his own business" and to continue with the route. The driver's record indicated that he had been arrested approximately 6 months before this collision and convicted of drunk driving. He was on probation for this offense at the time of this accident.

During the course of the examination by the Drug Recognition Expert (DRE), the officer noticed track marks on the driver's arms and constricted (1.5 mm diameter) pupils. In addition, the driver stated that he was a daily heroin user. Research indicates that the normal injection rate requirement is between 4 and 6 times per day. The passenger remained in the driver's presence for approximately 11 hours and did not observe the driver take any injections. A syringe containing a yellow substance was located near the driver as he was apprehended by police. Any delay in injection can create withdrawal symptoms consistent with the angry, irritable, aggressive behavior described by the passenger. The normal symptoms of heroin or opioid withdrawal can be partially masked by the depressant action of alcohol however, they cannot be totally camouflaged.

Although the probability of opiate presence was detected by the DRE, the only toxicological test sample taken for examination was blood. Heroin converts back to morphine in the body and can be detected in the urine and blood. The time period for discovery in a blood sample is significantly less than that in urine samples and is, therefore, less reliable. No urine was taken in this case and the blood test made from a sample was extracted 3.5 hours postcrash. The best method of detection for opiates is a urine test performed as soon as possible after the incident. Without these results, it is not possible to reliably determine the time of the driver's last injection of heroin.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was that the truckdriver, whose judgement and driving ability were impaired by a combination of probable opioid withdrawal and alcohol, failed to perceive and react to the slowing vehicles in time to avoid the collision. Contributing to the accident was the motor carrier's failure to take positive action to remove the driver from the truck after being notified of the driver's condition.

OF INTEREST IN THIS INVESTIGATION:

1. Alcohol/Drugs
2. Driving History
3. Motor Carrier Oversight of Driver
4. Motor Carrier Oversight of Equipment

CASE NO.: 146

Investigation No.: DEN-87-H-TR07
Accident Location: Interstate 70, inside Vail, Colorado
Lanes: 4 lanes, divided
Shoulders: Outside shoulder 6 feet of asphalt surface, median shoulder undetermined width of asphalt surface
Median: 100-foot wide earthen median with small aspen trees
Features: Winding, -7 percent grade, mountainous
Date and Time: January 16, 1987, 8:20 a.m.
Ambient Conditions: Cloudy, 5°F, daylight, and dry
Heavy Truck Involved: 1982 GMC COE 3-axle tractor in combination with a loaded tank trailer
Motor Carrier: Groendyke Transport, Inc.
Type of Operation: Common carrier
Size of Operation: 700 power units
Total Weight of Truck(s): 76,040 pounds
Total Length of Truck(s): Undetermined
Other Vehicle Involved: No
Truck Fatalities: 1 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit was traveling over a mountain pass and began descending a 7 percent winding grade. According to the driver's statement, he was in fifth gear, low side of the transmission, when he passed the summit. As the truck began to gain speed, he tried to shift back down to fourth gear and was unable to do so. He continued to apply his brakes, which did not slow him appreciably. He reported his speedometer pegged out at 85 mph. He passed the first runaway truck ramp that he claimed came up too quickly. The driver reportedly shifted out of fifth gear again, but still could not get it into fourth, and then could not get the transmission back into fifth gear--leaving the truck freewheeling down the grade. As the combination unit continued down the road, the driver applied the trailer parking brakes, which did not slow the vehicle. He also passed a second escape ramp which he stated he did not see. While the driver was attempting to go around a curve to the left, the truck went off the right side of the roadway. The truck's right side tires dropped off into a culvert opening, causing the unit to roll over onto its right side. The truck traveled for 446 feet along the ditch before it struck the cut bank. After impact, the truck continued sliding for another 146 feet.

Both the tractor and trailer were destroyed in the accident. The cab was torn from the chassis and both ends of the tank were ruptured, spilling the contents. Both the driver and his unauthorized passenger were unrestrained and ejected. The driver was knocked unconscious and received additional minor injuries; the passenger was fatally injured.

An examination of the vehicle revealed that six out of the nine brakes which could be checked were out of adjustment. Most of the drums showed signs of heat cracks and discoloration. Four and one-half quarts of liquid were drained from the first air tank reservoir. Chipped gear teeth were also found on the low range gears in the transmission. According to the driver's statement, the low-air warning light had come on and a witness reported seeing smoke coming from the trailer wheels.

When the driver's statement of his activities for 72 hours before the accident was checked with his fuel receipts and other documents, many places and times did not match. His total hours on duty for the previous 8 days was 69.5 hours. In the 53 hours preceding the accident, the operator of the truck had only 10 hours of sleep. On January 6, 1987, he logged 11.75 hours of driving and on January 10, 14.75 hours of driving.

The tanker contained 5,057 gallons of crude petroleum treating compound, all of which spilled on impact. The load was placarded properly, but the driver was unaware of the exact contents of his load. The shipping company had not provided papers detailing the exact contents of the load. A safety official with the carrier stated that often the shipper would not disclose the chemical contents of the product because certain contents would provoke higher shipping charges. As a result, it took 4 hours to properly identify the cargo and the hazards presented.

The operator of the combination unit had 12 years experience driving heavy trucks and no formal training. He stated that he had been fearful of driving over mountain passes because a relative had been killed in a runaway truck accident. In the last 5 years, he had one speeding violation. No accidents were recorded on his record for the past 10 years.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was a combination of the improperly maintained brake system and the driver's inexperience with driving over mountainous terrain.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Motor Carrier Oversight of Equipment
3. Hazardous Material

CASE NO.: 155

Investigation No.: ATL-87-H-TR11
Accident Location: Georgia Highway 26 at MP 163, 2 miles east of Montezuma, Georgia
Lanes: 2 lanes, undivided
Shoulders: Variable width grass
Median: None
Features: Straight, level, at grade
Date and Time: March 19, 1987, 11:30 a.m.
Ambient Conditions: Clear, daylight, dry
Heavy Truck Involved: 1978 International conventional tractor in combination with a loaded 41-foot trailer
Motor Carrier: W.A. Sargent
Type of Operation: Private carrier
Size of Operation: 2 power units
Total Weight of Truck(s): about 77,000 pounds
Total Length of Truck(s): 50 feet
Other Vehicle Involved: 1981 GMC 48-passenger church bus
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 31

SUMMARY:

A combination unit was traveling eastbound at a driver-reported speed of 50 mph when a westbound 48-passenger bus initiated a left turn into a commercial driveway. The truck moved into the west lane and the service brakes were applied. There was a westbound truck traveling behind the bus. As the combination unit driver observed the westbound truck, he steered back into the eastbound lane and impacted the right rear of the bus. The truck continued for 190 feet and came to rest upright in a ditch at the right road edge. The bus traveled an additional 10 feet after impact.

This accident resulted in substantial damage to both the power unit of the combination unit and to the right rear side of the bus. The unrestrained truckdriver was uninjured. No injuries resulted to the unrestrained busdriver. Thirty-one of the 34 bus passengers sustained minor to moderate injuries; 6 were hospitalized.

Postcrash inspection revealed that the service brakes on the truck were defficient--three wheels of the tractor were not braking. The motor carrier had no maintenance program and no company repair facility. The owner stated that he made daily visual inspections of his two trucks. The truckdriver reported that he had not inspected the combination unit. Georgia exempts agricultural trucks, including log trucks, from State safety requirements, e.g., vehicle inspections.

The truckdriver stated that he assumed that the busdriver had observed his oncoming truck and was going to wait to initiate his turn until he had passed by. The busdriver stated he did not see the truck.

The truckdriver had reportedly accumulated about 8 years of experience driving combination vehicles. A check made of the driver's violation history revealed three traffic violations--two for speeding and one for DWI. In addition, his driver's license had been suspended following the DWI conviction. The driver related to investigators that he had been convicted of an additional speeding violation about 10 days before the accident.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was failure of the busdriver to yield the right of way to oncoming traffic before initiating a left turn. Contributing to the severity of the crash was the inability of the truck to reduce its speed significantly due to inoperative brakes.

OF INTEREST IN THIS INVESTIGATION:

1. Driving History
2. Motor Carrier Oversight of Driver
3. Motor Carrier Oversight of Equipment

CASE NO.: 156

Investigation No.: DEN-87-H-TR13
Accident Location: Interstate 15 outside Beaver, Utah
Lanes: 4 lanes, divided
Shoulders: Median shoulder 10-foot asphalt, outside shoulder 4-foot asphalt
Median: Undetermined width of grass
Features: Straight, at grade, +1 percent upgrade
Date and Time: April 29, 1987, 7:15 a.m.
Ambient Conditions: Clear, 49°F, daylight, and dry
Heavy Truck Involved: (1) 1976 Peterbilt conventional 3-axle tractor in combination with a loaded 47-foot van trailer
Motor Carrier: MST Truckline
Type of Operation: Unknown
Size of Operation: Unknown
Heavy Truck Involved: (2) 1984 Kenworth conventional 3-axle tractor in combination with a loaded 47-foot van trailer
Motor Carrier: Belkins Van Lines Company
Type of Operation: Contract carrier
Size of Operation: 10 power units
Total Weight of Truck(s): (1)-Undetermined; (2)-Undetermined
Total Length of Truck(s): (1)-Undetermined; (2)-Undetermined
Other Vehicle Involved: None
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The driver of the Peterbilt had pulled off on the outside shoulder and activated his emergency flashers to check the air pressure in his tires. As he was pulling back into traffic using his left blinker, the driver noticed another tractor and trailer coming up behind him in the outside lane. The Peterbilt driver continued to gain to an estimated speed of 40 mph and looked in his mirror once more just as the Kenworth struck him in the rear of his trailer. The trailer doors were torn off and a small part of the load of hazardous materials was spilled on the highway. The Kenworth continued forward, veered left into the median, and came to rest with the tractor in the opposite lanes of travel and the trailer still partially in the median. The operator of the Peterbilt was able to get his vehicle stopped on the outside shoulder.

The Peterbilt tractor was not damaged; however, the rear portion of the trailer sustained substantial damage. Neither the driver nor the codriver of the Peterbilt was restrained or injured. Extensive damage to the front of the Kenworth tractor was noted and there was minor damage to the front of the trailer. The Kenworth driver received serious injuries.

An examination of the Kenworth tractor and its trailer revealed that 4 out of 10 of its brakes were in need of adjustment. The driver's log books were 3 days behind. It was determined that he had been driving or on duty for 30 hours without rest or sleep.

Drug paraphernalia and a bottle of bourbon were found in the cab of the Kenworth, along with three small bottles of a white powder. The Utah State Crime Laboratory identified the white powder as cocaine. Blood drawn from the Kenworth driver more than 3 hours after the accident was analyzed and was found to contain 0.05 micrograms per milliliter of cocaine and 1.2 micrograms per milliliter of benzoylecgonine. He was placed under arrest by the Utah State Patrol. Sixty days after the accident, the carrier had not initiated any disciplinary action against the driver of the Kenworth.

The trailer being pulled by the Peterbilt was loaded with various chemical products. A partial carton of chlorine trifluoride pellets was spilled on the highway. Emergency response personnel covered the pellets with plastic to contain them and to protect them from moisture. The driver of the Peterbilt provided the investigating officers with adequate information concerning his load of hazardous materials.

The operator of the Peterbilt had 2 years of experience operating heavy trucks with an annual estimated mileage of 15,000 miles. He stated that he had never received any formal training for driving commercial vehicles. In the last 3 years, his driving record showed no violations or accidents. The driver of the Kenworth combination had been operating heavy trucks for 7 years, with an estimated average of 135,000 miles each year and had never received any formal training in the operation of heavy trucks. His driving record showed seven violations in the last 3 years and two accidents in the past 5 years, none of which were reported to the carrier.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the Kenworth driver's failure to perceive the preceding Peterbilt due to his impairment from a combination of acute fatigue and the ingestion of cocaine. Contributing to the accident was the slower speed of the Peterbilt combination.

OF INTEREST IN THIS INVESTIGATION:

1. Fatigue/Duty Hours
2. Alcohol/Drugs
3. Driving History
4. Motor Carrier Oversight of Driver
5. Motor Carrier Oversight of Equipment
6. Hazardous Material

CASE NO.: 164

Safety Board Investigation No.: CHI-87-H-TR02
Accident Location: State Route 131, Lake County, Illinois
Lanes: 4 lanes, undivided
Shoulders: Gravel, varying width
Median: None
Features: Signalized intersection
Date and Time: October 17, 1986, 12:18 p.m.
Ambient Conditions: Clear, dry, daylight
Heavy Truck Involved: (1) 1976 conventional Peterbilt in combination with a loaded 24-foot gravel-dump trailer
Motor Carrier: (1) Kirschhoffer Truck Service, Inc.
Type of Operation: (1) Common carrier
Size of Operation: (1) 15 power units
Heavy Truck Involved: (2) 1985 COE Kenworth tractor in combination with a loaded 45-foot flatbed trailer
Motor Carrier: (2) The Hickow Corporation
Type of Operation: (2) Common carrier
Size of Operation: (2) 330 power units
Total Weight of Truck(s): (1) Not determined (2) 38,365 pounds
Total Length of Truck(s): (1) Not determined (2) Not determined
Other Vehicles Involved: 6 passenger vehicles
Truck Fatalities: 1 Truck Injuries: 1
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The Peterbilt combination unit was traveling south when it entered a signalized intersection. Witnesses stated that the signal light was red for southbound traffic. An eastbound Kenworth preceding through the intersection at the same time was struck in the left side of the tractor cab by the front of the southbound tractor. Investigators recorded 26 feet of preimpact skidmarks from the southbound combination unit. From the area of impact, the two combination vehicles remained together as they traveled southeasterly for over 130 feet to a position of final rest in a restaurant parking lot. At final rest the gravel-dump trailer of the Peterbilt was partially overturned. Six passenger vehicles received damage from either the combination units or portions of the trailers' loads.

The driver of the Kenworth was ejected and fatally injured during the collision sequence. The Peterbilt driver received serious injuries which required hospitalization. Neither driver was restrained. Both tractors were destroyed, and the trailers received substantial damage.

The driver of the Peterbilt refused to furnish training and experience information, and his employer did not maintain employment records. A search of driving history revealed that he had received four convictions and five warnings of unsafe vehicle violations in the 2 years preceding this accident. He had been involved in 4 accidents in the 10 months preceding this accident, including three in the accident-involved tractor. Toxicology tests performed as a result of this accident revealed the presence of cocaine, phenylpropanlamine, and ephedrine in the driver's system.

A postcrash inspection of the Peterbilt combination unit resulted in the vehicle being placed out of service due to multiple safety violations. The violations noted included a missing brake drum on one axle, tire cord exposed on at least two tires, and broken suspension components. The carrier had been in operation for approximately 2 1/2 years, yet had not complied with Federal or State recordkeeping requirements, vehicle inspections, or driver history checks. The motor carrier stated to investigators that had they known of the driver's drug use, driving record, or the condition of his truck, he would not have been employed. At the request of the Safety Board, an audit of the carrier was conducted by the BMCS. The BMCS cited the carrier for multiple violations regarding driver qualification files, vehicle inspections, records of duty status, and maintenance records. An "unsatisfactory" rating was assigned to the carrier.

The Kenworth driver had been operating heavy trucks for 19 years and had been contracted to his carrier for 5 months. A search of his driver history records revealed five traffic violations in the past 5 years. No record of accident involvement in that 5-year period was found.

PROBABLE CAUSE:

The National Transportation Safety Board determined that the probable cause of this accident was the failure of the Peterbilt driver to obey the traffic signal at the intersection. It is not known to what extent the driver's use of cocaine was a factor in the accident.

OF INTEREST IN THIS INVESTIGATION:

1. Alcohol/Drugs

2. Driving History

3. Motor Carrier Oversight of Driver

4. Motor Carrier Oversight of Equipment

CASE NO.: 168

Investigation No.: SEA-87-H-TR11
Accident Location: State Highway 35, near Polson, Montana
Lanes: 2 lane, 2 direction
Shoulders: South: 2-foot dirt, north: 26-foot asphalt
Median: None
Features: Straight, level, near intersection
Date and Time: August 3, 1987, 6:55 p.m.
Ambient Conditions: Dry roadway, daylight
Heavy Truck Involved: 1978 Peterbilt COE tractor in combination with one empty 45-foot van trailer and one empty 27-foot van trailer
Motor Carrier: Missoula Cartage
Type of Operation: Contract carrier
Size of Operation: 73 power units, 4 trucks
Total Weight of Truck(s): 36,000 pounds
Total Length of Truck(s): 94 feet 4 inches
Other Vehicle Involved: 1978 Ford pickup
Truck Fatalities: 0 Truck Injuries: 1
Other Fatalities: 1 Other Injuries: 0

SUMMARY:

The combination unit was traveling eastbound at a tachograph-recorded speed of 55 mph when preceding traffic began slowing. As the operator of the combination unit applied brakes, the tractor drive axle tires and trailer tires began to slide. The tractor began a counterclockwise rotation and crossed into the westbound lane of traffic where it was struck on the right side by a westbound pickup truck. Approximately 300 feet of skidmarks from the combination vehicle preceded the impact. The tractor came diagonally across the roadway, facing northeast, and the rear trailer came to rest in the eastbound lane facing east. The pickup came to rest on the north shoulder facing west.

This accident resulted in minor injuries to the unrestrained driver of the combination unit. The tractor received moderate damage. Minor damage was noted at the left front of the first trailer while the convertor dolly and rear trailer were undamaged. The pickup truck was destroyed and its unrestrained driver fatally injured. Toxicology tests were negative for both drivers.

The combination unit driver had 17 years experience with heavy vehicles. He had been employed by the carrier for 8 years, averaging approximately 100,000 miles per year, and had driven twin trailer combination units for the past year. He stated that his father had taught him to drive trucks and that he had never received formal training. The motor carrier had provided limited training. A search of his driving history revealed no violations or accidents for the past 5-year period.

The tractor was not equipped with front axle brakes. No observable defects were noted to the remainder of the vehicle's brakes. Maintenance records revealed that the tractor's, lead trailer's, and rear trailer's brakes had been adjusted 4 days (535 miles) before the accident.

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the truckdriver to pay attention to the preceding traffic, thereby causing a delay in brake application. Contributing to the accident was the absence of steering axle brakes which resulted in the jackknife of the tractor.

OF INTEREST IN THIS INVESTIGATION:

1. Double Trailers

CASE NO.: 178

Investigation No.: DEN-87-H-TR20
Accident Location: Larimer County Road 70, Wellington, Colorado
Lanes: 2 lanes, undivided
Shoulders: 5 feet wide, gravel
Median: None
Features: -3 percent grade, grade crossing
Date and Time: June 30, 1987, 6:20 a.m.
Ambient Conditions: Clear
Heavy Truck Involved: 1987 Kenworth tractor in combination with a loaded 40-foot tank trailer
Motor Carrier: Wofford Trucking Company
Type of Operation: Common carrier
Size of Operation: No information
Total Weight of Truck(s): 79,500 pounds
Total Length of Truck(s): Not determined
Other Vehicle Involved: Train
Truck Fatalities: 0 Truck Injuries: 0
Other Fatalities: 0 Other Injuries: 0

SUMMARY:

The combination unit loaded with 6,972 gallons of crude oil was traversing a 3 percent downgrade on a straight section of roadway and was approaching a Burlington Northern grade crossing. The driver indicated that he applied the brakes when he first saw the train. Realizing he could not stop in time, he released the brakes and accelerated in an attempt to beat the train to the crossing. The combination unit left 116.7 feet of skidmarks with the left rear trailer tire and 59.8 feet of skidmarks with the right rear trailer tires.

The lead locomotive struck the center portion of the trailer. The impact resulted in the destruction of the trailer and a resulting oil spill. Colorado State Law 42-4-608, in part, requires vehicles carrying hazardous material to stop at grade crossing not more then 50 feet from or less then 15 feet from the nearest rail.

Inspection of the trailer brakes revealed that all brakes were out of adjustment. The tractor was not available for inspection. The lead locomotive and tractor received minor damage.

Information from the driver showed he had 6 years experience operating articulated vehicles. In this time, he had not received any formal training in the operation of the equipment or safety training. The motor carrier did not respond to requests for information on the company or the driver.

There was a grade crossing information sign 1/5 mile west of the crossing. The road and grade crossing were properly marked by passive warning devices. There is unobstructed visibility in either direction for 3/4 mile for eastbound traffic.

Wellington, Colorado
Case No. 178

PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the driver's operation of the truck at a speed which precluded a successful stop for the crossing. Contributing to the accident was the misadjusted trailer brakes.

OF INTEREST IN THIS INVESTIGATION:

1. Driver Training/Experience

2. Motor Carrier Oversight of Equipment

3. Hazardous Material

4. Grade Crossing

*U.S. GOVERNMENT PRINTING OFFICE:1988-242-370:80139

END
DATE
FILMED
2-15-89
NTIS